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ABSTRACT

This instructional package designed for visually impaired students, focuses on the vocational area of small engine repair. Contained in this document are forty learning modules organized into fourteen units: engine block; starters, fuel tank, lines, filters and pumps; carburetors; electrical; test equipment; motorcycle; machining; tune-ups; short blocks; storage; ring and piston service; valve service; and overhaul. Each module, printed in block type, includes these elements: a performance objective page telling what will be learned, what materials will be needed, and how the student will be evaluated; information and job step pages which provide information needed to perform the activity and detail steps necessary to do the task. (Visuals are designed for the visually impaired.) (This document is one of three sets of learning modules on small engine repair written in formats designed for visually impaired, low reader/educable mentally impaired, and regular vocational students. The modules are part of a total set which includes over 1,300 modules written in a variety of formats on building maintenance, dietetic assistant, small engine repair, medical assistant, and graphics. (JH)

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ED158105

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CAPITAL AREA CAREER CENTER
Ingham Intermediate School District
611 Hagadorn Road
Mason, Michigan 48854

TO:

MULTIPLE LEARNING STRATEGIES PROJECT

SMALL ENGINE REPAIR

Visually Impaired

CE 017 583

small engine repair

unit: ENGINE BLOCKS

capital area career center

module: 7501 01 002 7 date: 6/77 level:

skill title: REMOVE AND REPLACE SUMP ON AUXILIARY P. T. O. TYPE BRIGGS & STRATTON ENGINE

developed & written by: DON FOSTER & JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE AND REPLACE SUMP AND OIL SEAL ON A BRIGGS & STRATTON ENGINE WITH AN AUXILIARY P. T. O.

IN ORDER TO DO THIS YOU WILL NEED:

1. A BRIGGS & STRATTON ENGINE WITH AUXILIARY P. T. O.
2. SOCKET SET
3. TORQUE WRENCH
4. SCREWDRIVER SET
5. OIL DRAIN PAN
6. BRIGGS & STRATTON REPAIR INSTRUCTION MANUAL IV

WE WILL KNOW YOU CAN DO IT WHEN:

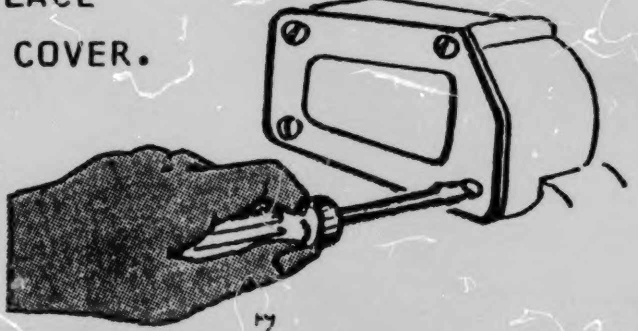
YOU HAVE REPLACED THE SUMP AND OIL SEAL ON THE ENGINE ACCORDING TO SPECIFICATIONS, SO THE SEAL DOES NOT LEAK WHEN THE ENGINE IS RUNNING.

A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.
2. CLEAN LOSE DIRT AND GREASE FROM THE ENGINE.
3. DRAIN OIL.
4. DRAIN OR SHUT OF FUEL.
5. CLEAN CRANKSHAFT, USING WIRE WHEEL ON GRINDER OR OLEUM AND EMERY CLOTH TO CLEAN P. T. O. END OF CRANKSHAFT.
6. REMOVE FOUR SCREWS HOLDING AUXILIARY DRIVE COVER IN PLACE AND THEN REMOVE COVER.



JOB STEPS

7. LIFT OUT SHAFT STOP.

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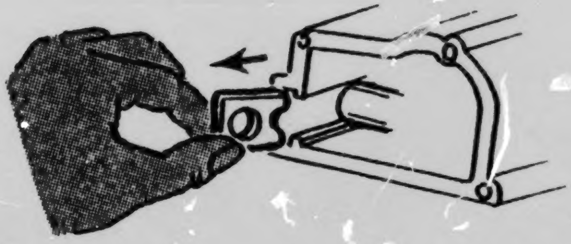
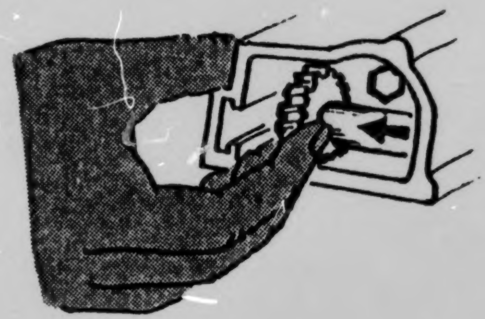


8. SLIDE GEAR AND SHAFT SIDEWAYS TO EXPOSE SUMP BOLTS.

→



9. REMOVE ALL SUMP BOLTS.

10. USING A RUBBER MALLET, TAP LIGHTLY ON SUMP TO LOOSEN THE SUMP.

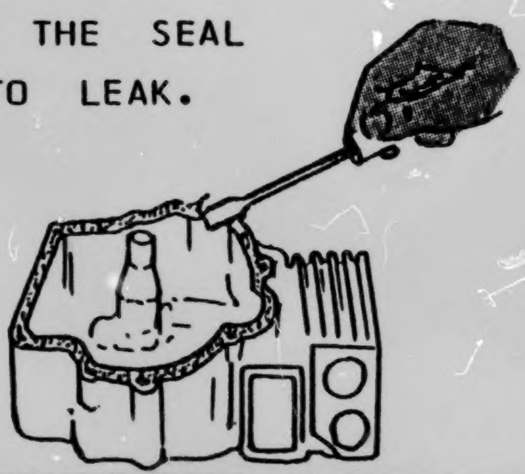
JOB STEPS

11. GRASP THE SUMP WITH BOTH HANDS AND TWIST BACK AND FORTH. THEN SLIDE THE SUMP OFF END OF CRANKSHAFT.

12. PLACE SUMP UPSIDE DOWN ON WORK BENCH. PLACE A LARGE SCREWDRIVER UNDER THE EDGE OF THE SEAL AND PUSH DOWN ON HANDLE OF SCREWDRIVER UNTIL SEAL POPS OUT.

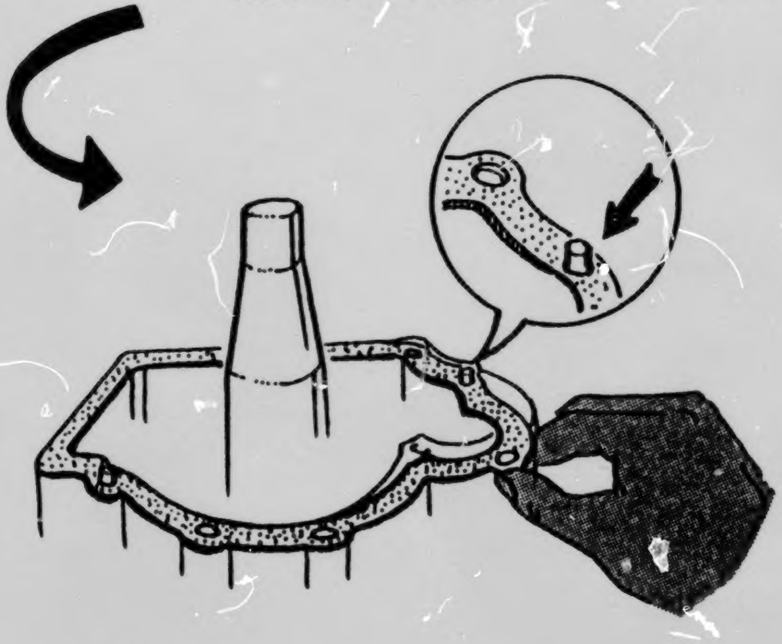
    NOTE: DON'T PUT SCREWDRIVER TOO FAR UNDER SEAL AS IT COULD SCAR THE BACK OF THE SEAL HOLE CAUSING IT TO LEAK.

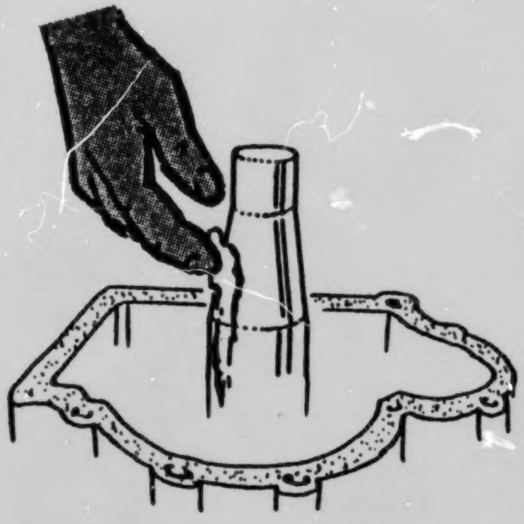
13. CLEAN OLD GASKET FROM THE BLOCK. ➞



JOB STEPS

14. INSTALL NEW GASKET ON BLOCK AND ALIGN GASKET ON ALIGNMENT DOWELS.





15. PUT LUBRIPLATE ON CRANKSHAFT TO ALLOW SUMP TO SLIDE FREELY.

16. INSTALL SUMP.

JOB STEPS

17. INSTALL TWO SUMP BOLTS AND TIGHTEN TO PROPER TORQUE FROM TORQUE SPECIFICATION CHART.

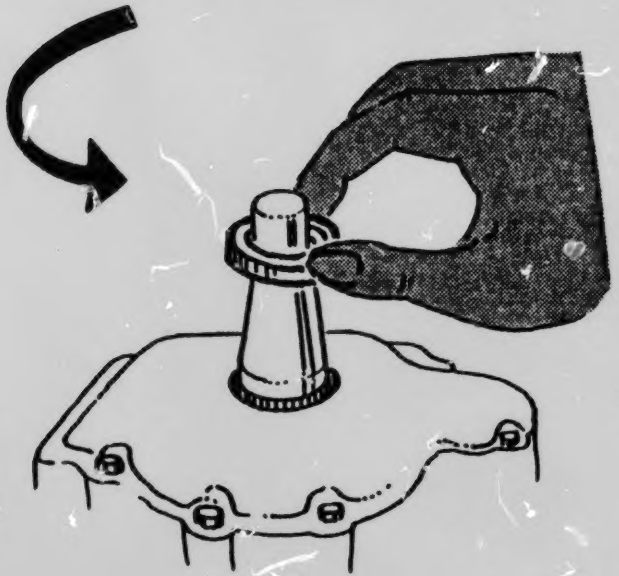
18. CHECK END PLAY. IF YOU DON'T KNOW HOW TO CHECK IT, REFER TO MOD 7501 01 017 ON CHECKING END PLAY.

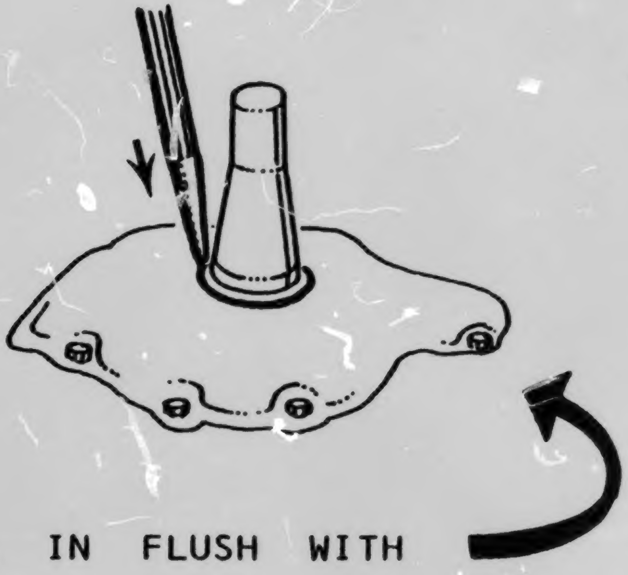
19. IF END PLAY IS OK, INSTALL REST OF SUMP BOLTS AND TORQUE. IF NOT, SEE YOUR INSTRUCTOR.

20. APPLY PROPER SEAL PROTECTOR OR TAPE CRANK TO PROTECT SEAL FROM SCRATCHES.

JOB STEPS

21. GENTLY SLIDE SEAL DOWN CRANKSHAFT UNTIL IT TOUCHES THE SUMP.





22. NOW, DRIVE THE SEAL IN FLUSH WITH THE SUMP.

23. CHECK FOR ENGINE BINDING BY TURNING FLYWHEEL.

JOB STEPS

24. INSTALL NEW AUXILIARY COVER GASKET AND COVER AND TIGHTEN SCREWS.

25. FILL WITH OIL AND FUEL.

26. START AND THEN CHECK FOR OIL LEAK.

27. HAVE YOUR INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 01 003 7 date: 6/77 level:

skill title: REMOVE CYLINDER HEAD, CHECK FOR WARP, ATTACH TO BLOCK AND TORQUE

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

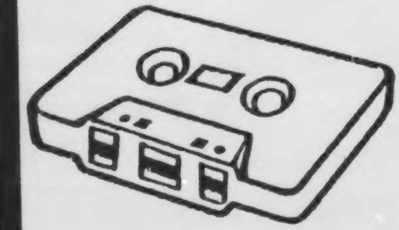
HOW TO REMOVE CYLINDER HEAD, CHECK HEAD FOR WARP, ATTACH TO BLOCK AND TORQUE ACCORDING TO SERVICE MANUAL SPECIFICATIONS.

AND IN ORDER TO DO THIS YOU WILL NEED:

ENGINE BLOCK
SURFACE BLOCK
FEELER GAUGE
SOCKET SET
TORQUE WRENCH
WIRE BRUSH
BELT SANDER
SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE FLATTENED THE CYLINDER HEAD AND GOTTEN THE ENGINE TO RUN WITHOUT ANY GASKET LEAK.



A TAPE OF THIS MODULE IS AVAILABLE

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CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

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WORD GUIDE

CYLINDER (HEAD) - METAL SECTION BOLTED TO TOP OF BLOCK.

INFORMATION

YOU NEED TO KNOW HOW TO REMOVE A CYLINDER HEAD, INSPECT AND SERVICE IT AND HOW TO PROPERLY PUT IT BACK ON THE BLOCK.

WHEN YOU TAKE THE SCREWS OUT OF THE HEAD, BE SURE TO SEE IF SOME ARE DIFFERENT LENGTHS. IF SOME ARE, BE SURE TO PUT THEM BACK IN THE RIGHT HOLES.

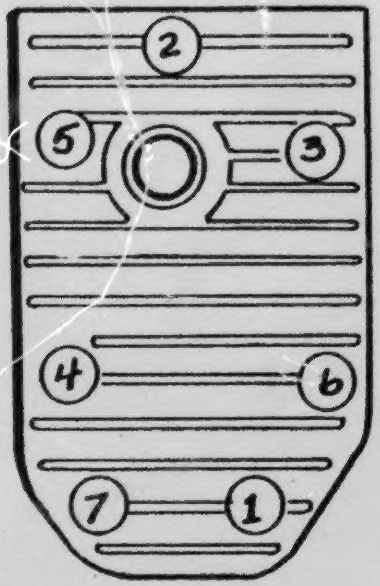
YOU MUST ALSO CHECK THE SERVICE MANUAL FOR PROPER HEAD SCREW TIGHTENING SEQUENCE AND TORQUE SPECIFICATIONS.

WORD GUIDE

SEQUENCE - SERIES, CORRECT ORDER OF STEPS.

INFORMATION

FOR A B & S MODEL 92902, THE SEQUENCE IS:



THE PROPER TORQUE SPECIFICATION IS 140 INCH POUNDS. BE SURE NOT TO USE GASKET CEMENT ON THE HEAD GASKET.

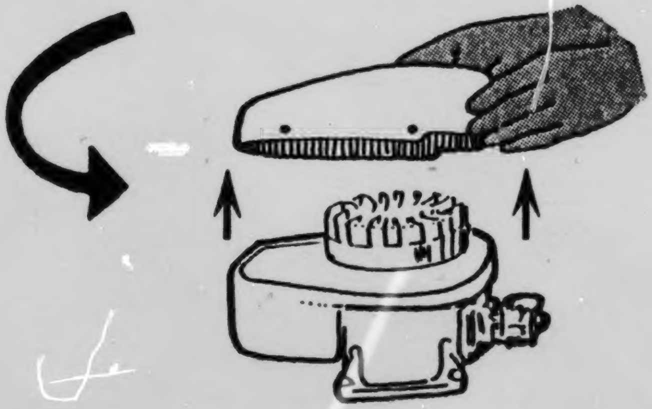
1-

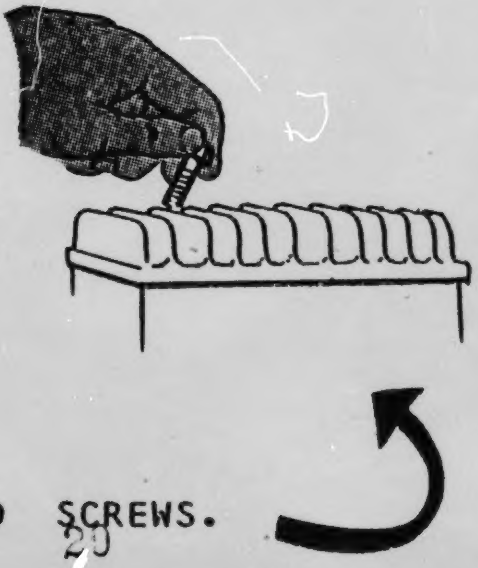
JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

2. CLEAN LOOSE DIRT AND GREASE FROM THE BLOCK AND HEAD.

3. REMOVE SHROUD, IF IT IS ATTACHED TO THE HEAD.





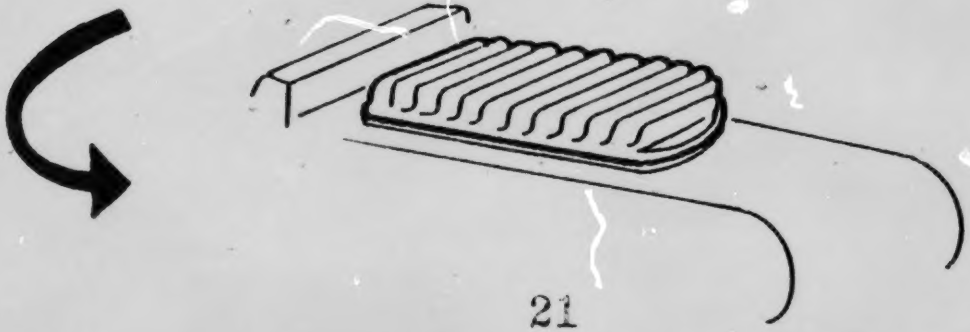
4. REMOVE CYLINDER HEAD SCREWS.

JOB STEPS

5. USING WIRE BRUSH AND CARBON SCRAPER, CLEAN CARBON FROM PISTON HEAD, BLOCK AND TOP OF THE PISTON.

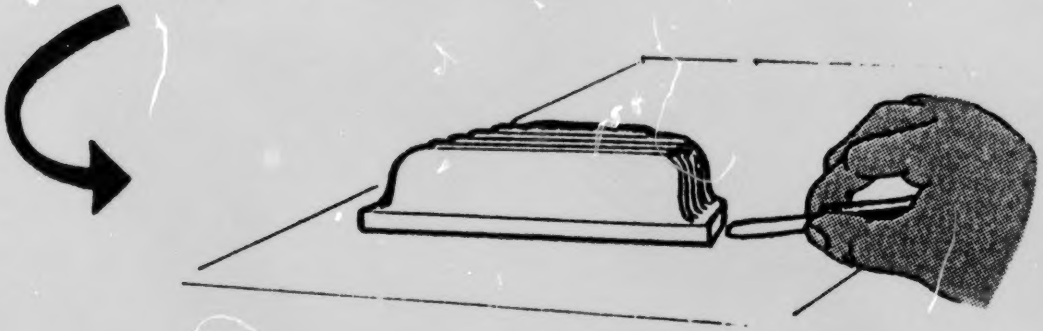
6. USING WIRE BRUSH, CLEAN THE HEAD PINS.

7. LAY HEAD ON BELT SANDER. HOLD LIGHTLY BUT FIRMLY ON SANDER. THEN, TURN ON SANDER AND ALLOW TO RUN ABOUT 30 SECONDS. TURN OFF SANDER AND CHECK SURFACE OF HEAD. IF IT ISN'T LEVEL OR SMOOTH REPEAT THIS STEP.



JOB STEPS

8. PUT THE HEAD ON A SURFACE PLATE TO BE SURE IT IS FLAT. USE A THICKNESS GAUGE TO CHECK IT.



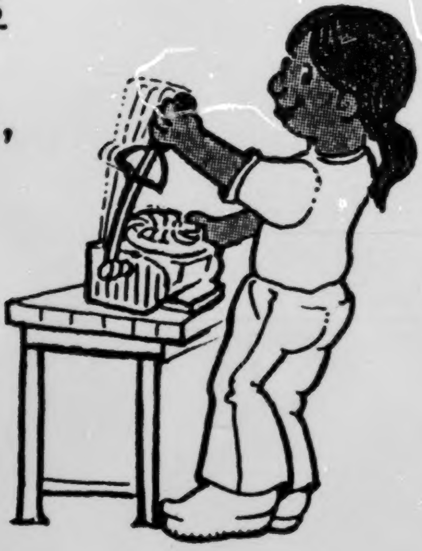
9. INSTALL NEW GASKET ON THE BLOCK.

10. INSTALL HEAD ON NEW GASKET.

11. INSTALL HEAD SCREWS AND TORQUE. BE SURE TO USE THE PROPER TIGHTENING SEQUENCE AND TO TIGHTEN EACH SCREW SLOWLY.

JOB STEPS

12. USING A TORQUE WRENCH, TIGHTEN BOLTS TO PROPER TORQUE SPECIFICATIONS.



13. REPLACE SHROUD.

14. CHECK OIL LEVEL.

15. START THE ENGINE AND VISUALLY CHECK FOR LEAKS AROUND THE GASKET.

16. SHUT OFF THE ENGINE.

JOB STEPS

17. RE-TORQUE THE HEAD BOLTS.

18. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 01 004 7 **date:** 6/77 **level:**

skill title: SERVICING CAMSHAFTS

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE CAMSHAFT AND TAPPETS, CHECK CAMSHAFTS FOR CRACKS, CHIPPED TEETH OR WORN LOBES, MIKE, JOURNALS, AND INSTALL CAMSHAFT.

AND IN ORDER TO DO THIS YOU WILL NEED:

FOUR CYCLE ENGINE

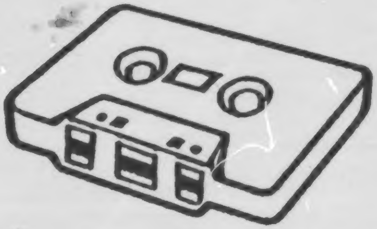
HAND TOOLS

TORQUE WRENCH

MICROMETER

WE WILL KNOW YOU CAN DO THIS WHEN:

YOU HAVE REMOVED THE CAMSHAFT AND TAPPETS; CHECKED THE CAMSHAFT FOR CRACKED OR CHIPPED TEETH AND WORN LOBES; INSTALLED THE CAMSHAFT AND TIMED IT TO THE CRANKSHAFT ACCORDING TO SERVICE SPECIFICATIONS.

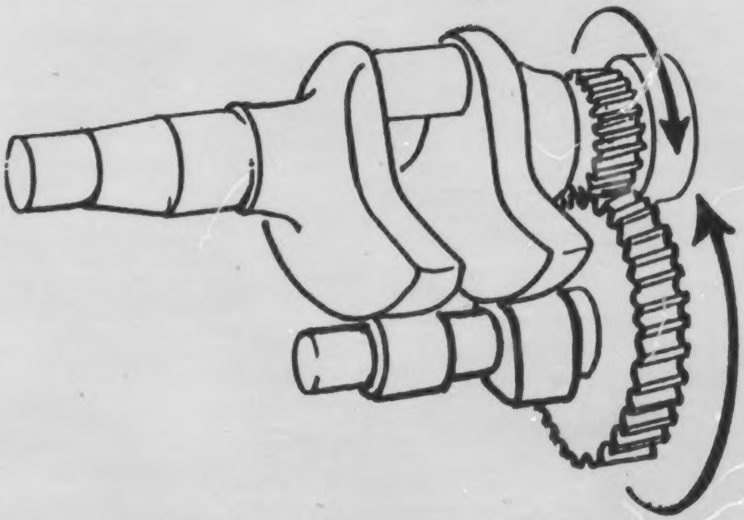


A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

THE CAMSHAFT MAKES THE VALVES WORK. SMALL ENGINES USUALLY HAVE ONE CAMSHAFT. THE CAMSHAFT HAS ONE LOBE FOR EACH VALVE. WHEN THE CAMSHAFT GOES AROUND, IT LIFTS THE VALVE FROM ITS SEAT.

CAMSHAFTS ARE MADE OF STEEL OR CAST IRON. THE SURFACES ARE HARDENED TO MAKE THE CAMSHAFT WEAR LONGER. MOST SMALL ENGINES HAVE GEARS THAT MESH WITH THE CRANKSHAFT GEAR. THE CAMSHAFT AND CRANKSHAFT TURN TOGETHER.



JOB STEPS

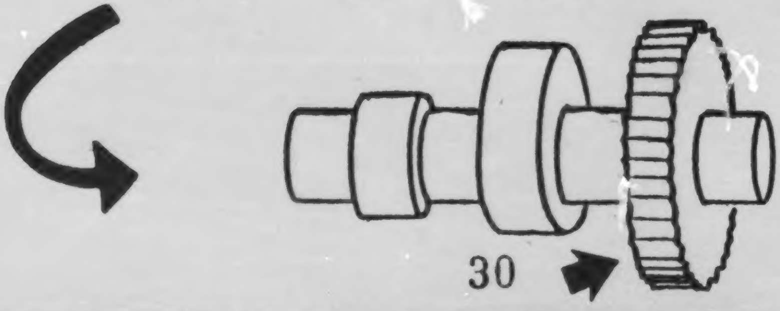
1. GET THE ENGINE YOU ARE TO WORK ON FROM YOUR INSTRUCTOR.

2. REMOVE THE ENGINE SUMP, AS IN MODULE 7501 01 002.

3. REMOVE CRANKSHAFT, AS IN MODULE 7501 01 021.

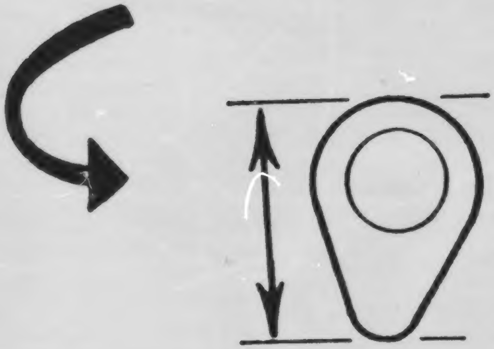
4. THE TAPPETS WILL FALL OUT WHEN THE CRANKSHAFT IS TAKEN OUT. BE SURE TO SEE WHERE THE TAPPETS CAME FROM. THEY MUST BE PUT BACK IN ORDER.

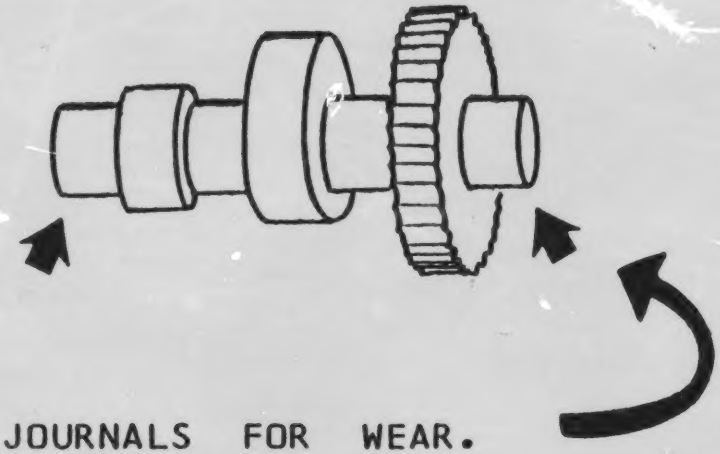
5. LOOK AT THE CAM GEAR TEETH FOR CHIPS AND CRACKS.



JOB STEPS

6. MEASURE CAM LOBES FOR WEAR. LOOK UP THE SPECIFICATION IN THE SERVICE MANUAL.



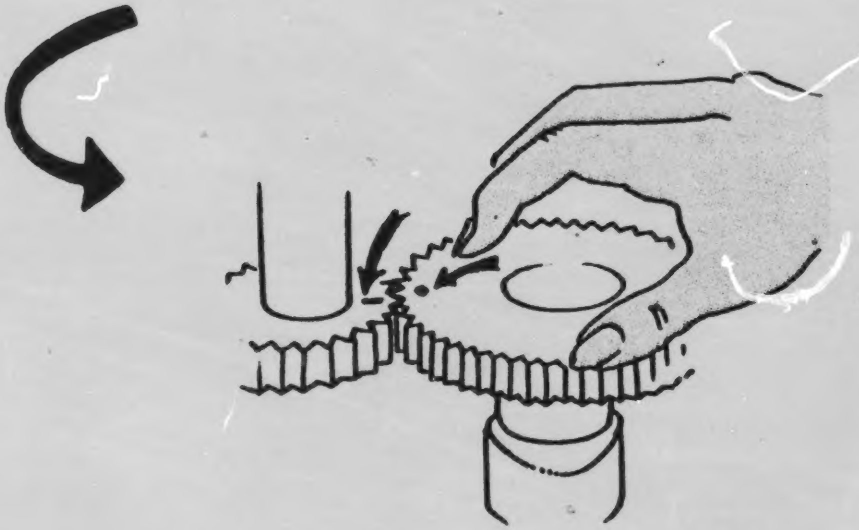


7. CHECK CAMSHAFT JOURNALS FOR WEAR. LOOK UP THE SPECIFICATION.

8. PUT THE TAPPETS BACK IN THE SAME WAY THEY CAME OUT.

JOB STEPS

9. FIND THE TIMING MARK ON THE CRANKSHAFT. TURN THE CRANKSHAFT SO THE MARK ON THE CRANKSHAFT GEAR AND THE CAMSHAFT ARE ALIGNED.



10. INSTALL THE CAMSHAFT.

JOB STEPS

11. INSTALL THE SUMP. BE SURE TO USE NEW GASKETS AND SEAL. SEE MOD 7501 01 002. BE SURE TO TORQUE ALL BOLTS.

12. CHECK THE ENGINE OIL. START THE ENGINE TO BE SURE IT RUNS.

13. HAVE YOUR INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 01 009 7 date: 6/77 level: IV

skill title: CHECK ROD AND ROD CAP FOR SCORRING, REPLACE PISTON TO ROD, COMPRESS PISTON RINGS, AND INSTALL PISTONS, AND TORQUE CAP NUTS AND BOLTS

developed & written by: DON FOSTER AND JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO DISASSEMBLE, INSPECT AND CLEAN ENGINE PARTS; INSTALL RINGS, PISTONS, CRANKSHAFT, AND CHECK VALVE TIMING.

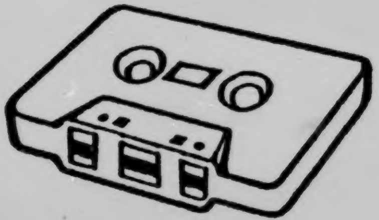
AND IN ORDER TO DO THIS YOU WILL NEED:

ENGINE
HAND TOOLS
TORQUE WRENCH
RING COMPRESSOR
MICROMETER
RING GROOVE CLEANER
RING EXPANDER
FEELER GAUGE

SAFETY GLASSES

WE WILL KNOW YOU CAN DO THIS WHEN:

YOU HAVE DISASSEMBLED AND INSPECTED THE ENGINE PARTS, CLEANED THE ENGINE PARTS, INSTALLED RINGS, PISTON AND CRANKSHAFT AND CHECKED VALVE TIMING ACCORDING TO SERVICE MANUAL SPECIFICATIONS.

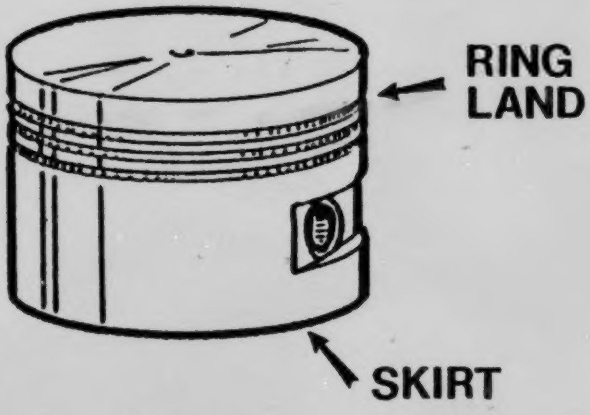


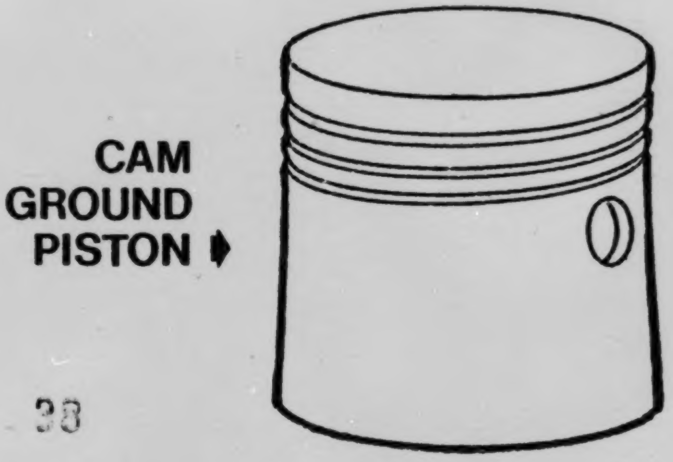
A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

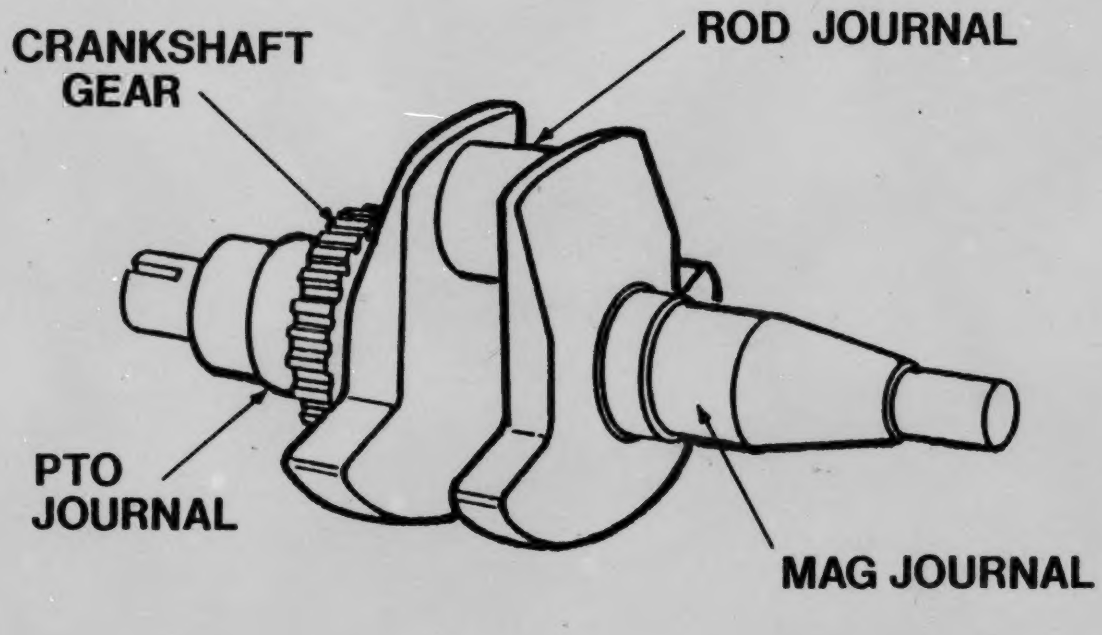
NOT ALL PISTONS ARE PERFECTLY ROUND. SOME ARE CAM GROUND; THAT MEANS THAT THEY ARE WIDER ONE WAY THAN THE OTHER. THE WIDEST SIDE IS USUALLY THE OPPOSITE DIRECTION OF THE WRIST PIN HOLES. THE REASON FOR A CAM GROUND PISTON IS FOR A MORE UNIFORM FIT AFTER THE PISTON GETS HOT AND EXPANDS. IF YOU HAVE ANY QUESTIONS CHECK WITH YOUR INSTRUCTOR. NOTICE ALSO THAT THE PISTON IS USUALLY SMALLER IN DIAMETER AT THE RING LAND AREA OF THE PISTON THAN THE SKIRT AREA OF THE PISTON.





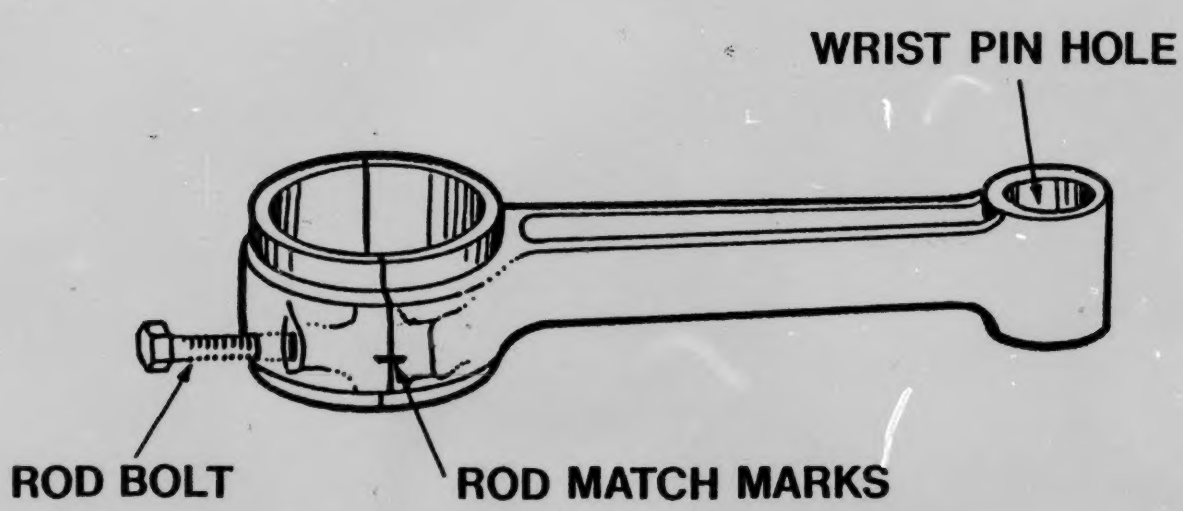
INFORMATION

STUDY THESE CRANKSHAFT ILLUSTRATIONS AND BE SURE YOU KNOW THE DIFFERENT PARTS.


CRANKSHAFT GEAR
ROD JOURNAL
PTO JOURNAL
MAG JOURNAL

INFORMATION

STUDY THESE CONNECTING ROD ILLUSTRATIONS AND BE SURE YOU KNOW THE DIFFERENT PARTS.


WRIST PIN HOLE
ROD BOLT
ROD MATCH MARKS

JOB STEPS

1. GET THE ENGINE YOU ARE GOING TO WORK ON FROM YOUR INSTRUCTOR.

2. REMOVE HEAD AND AIR HOUSING.

3. DRAIN OIL.

4. REMOVE FLYWHEEL IF THE ENGINE IS:

   A. BRIGGS - IT CAN BE PULLED WITH A SPECIAL PULLER OR IF A KNOCK OFF IS AVAILABLE IT WILL BE QUICKER TO REMOVE THE FLYWHEEL WITH THE KNOCK OFF.

   B. TECUMSEH - SOME FLYWHEELS CAN BE REMOVED WITH A PULLER, IF THE FLYWHEEL HAS PULLER HOLES. IF IT DOESN'T, A KNOCK OFF WILL HAVE TO BE USED TO REMOVE THE FLYWHEEL.

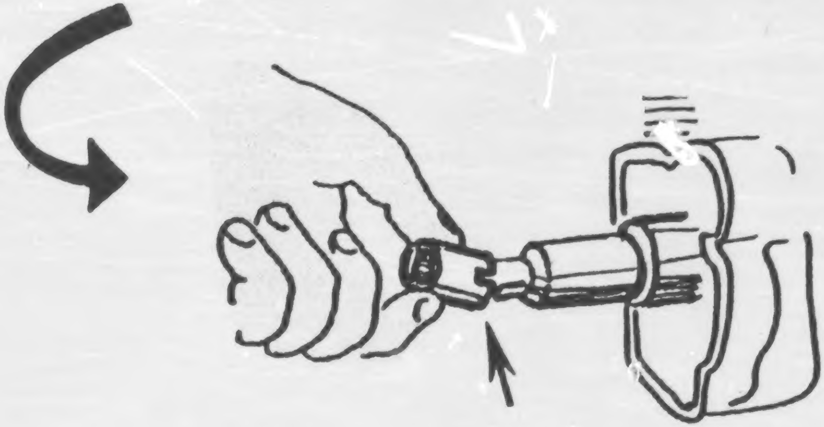
JOB STEPS

C. CLINTON - YOU CAN USE THE KNOCK OFF ON ALL FLYWHEELS.

D. KOHLER - ALWAYS USE A PULLER AND THE BOLT HOLES PROVIDED IN THE FLYWHEEL, BECAUSE THE CRANKSHAFT WILL POSSIBLY BREAK OR FRACTURE WHEN STRUCK WITH A HAMMER. SOME KOHLER ENGINES USE CERAMIC MAGNETS AND CAN BE BROKEN WHEN HAMMERED TO REMOVE THE FLYWHEEL. ALWAYS USE PULLERS ON KOHLER ENGINES TO REMOVE FLYWHEEL.

JOB STEPS

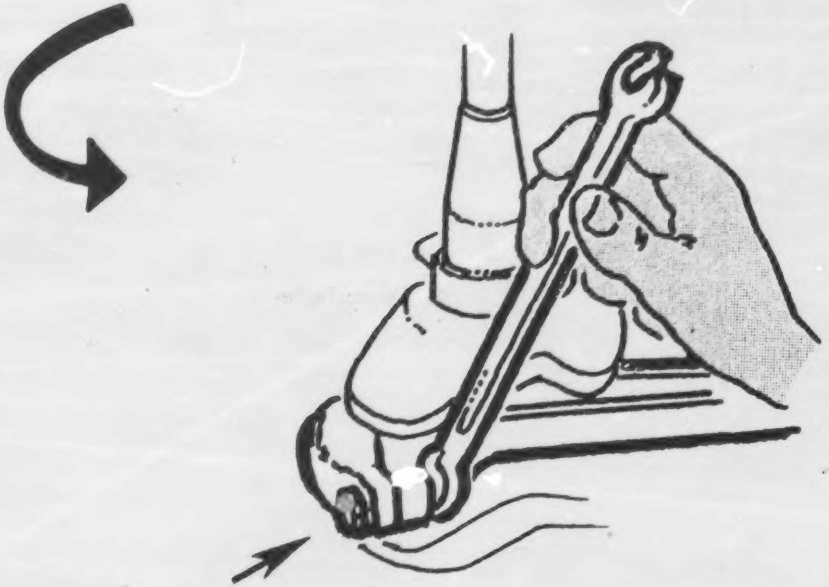
5. IF THE ENGINE HAS A REMOVABLE POINT CAM, NOW IS THE TIME TO REMOVE IT. JUST PULL IT OFF OF THE CRANKSHAFT. CLINTON AND TECUMSEH USUALLY HAVE REMOVABLE POINT CAMS. BRIGGS DOESN'T.



6. REMOVE SUMP AS YOU LEARNED IN MODULE 7501 01 001.

JOB STEPS

7. REMOVE ROD BOLTS OR NUTS.



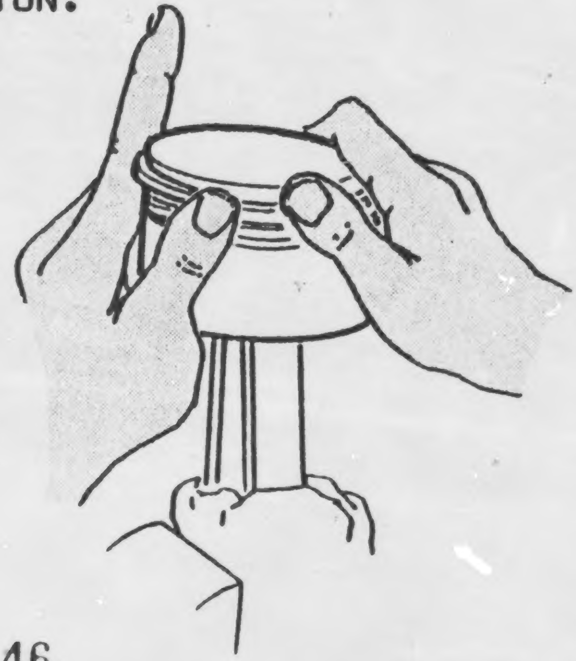
8. LOOK AT ROD AND THE WAY IT IS INSTALLED ON THE CRANKSHAFT BEFORE REMOVING ROD AND PISTON FROM THE BLOCK.

1-

JOB STEPS

9. TO REMOVE ROD AND PISTON, PUSH UPWARD WITH ONE HAND AND WITH OTHER HAND BE READY TO HOLD PISTON AS IT COMES OUT OF THE CYLINDER.

10. REMOVE PISTON RINGS, STARTING WITH THE TOP RING FIRST. TAKE ALL RINGS OFF THE TOP OF THE PISTON.



WORD GUIDE

SCORRING - SCRAPES, SCRATCHES

GALLING - LOOKS SIMILAR TO A WELD ON THE PISTON AND LIKE A RIP IN THE CYLINDER.

JOB STEPS

11. STUDY DRAWING OF PISTON IN THE INFORMATION SECTION OF THIS MODULE.

12. INSPECT CYLINDER FOR NOTICABLE DAMAGE. CHECK FOR SCORRING IN ALL TYPES OF CYLINDERS. ON CYLINDERS THAT ARE CHROMEPLATED CHECK FOR PEELING CHROME; ON ALUMINUM CYLINDERS CHECK FOR GALLING.

13. IF THERE IS NO APPARENT DAMAGE TO THE CYLINDER GO ON. IF THERE IS, SEE YOUR INSTRUCTOR.

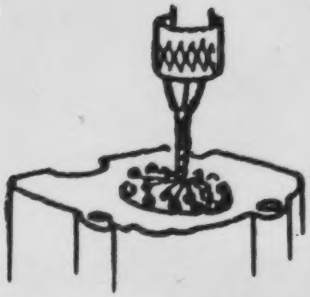
JOB STEPS

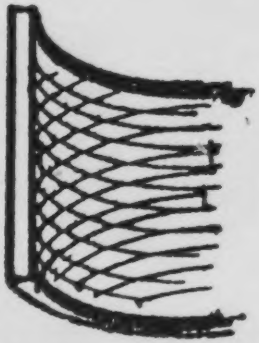
14. NOW REMOVE THE CRANKSHAFT.

15. CHECK BEARING JOURNALS (ROD JOURNAL ON THROW AND MAG AND P.T.O. SIDE OF CRANKSHAFT. REFER TO THE DRAWING OF CRANKSHAFT IN THE INFORMATION SECTION.

16. REMOVE OIL SEALS FROM THE BLOCK AND SUMP. REFER TO MODULE 7501 01 001.

17. DEGLAZE THE CYLINDER. REFER TO MODULE 7501 06 004.





JOB STEPS

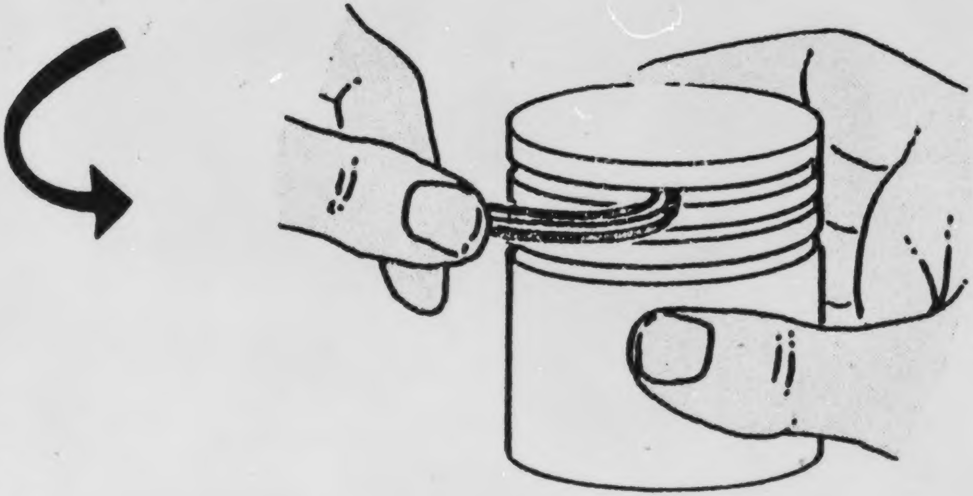
18. CHECK CLEARANCE SPECIFICATIONS FOR PARTICULAR ENGINE MODEL IN MANUAL.

19. NEXT HOLD ONTO THE ROD AND PUT THE PISTON IN THE CYLINDER. USE A FEELER GAUGE OF THE RIGHT SIZE AND CHECK CLEARANCE. ALWAYS CHECK CLEARANCE ON SIDE OF PISTON OPPOSITE WRIST PIN HOLES.

20. NOW LIST ALL PARTS YOU WILL NEED TO REASSEMBLE THE ENGINE PROPERLY. (SEALS, GASKET SET RINGS, ETC). ON THE WORK ORDER TRY TO GET ALL OF THE PARTS YOU NEED LISTED THE FIRST TIME.

JOB STEPS

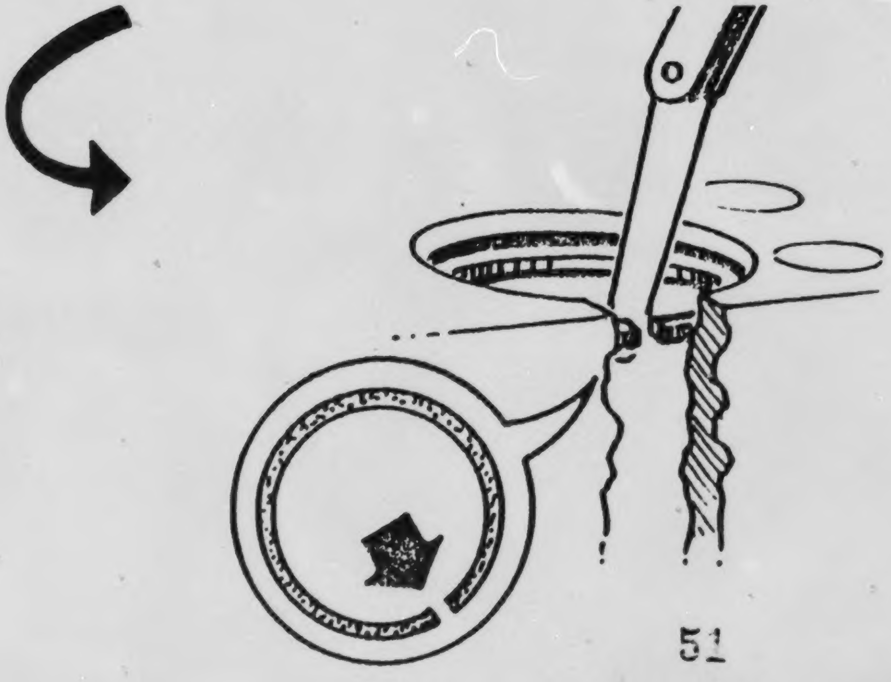
21. CLEAN RING GROOVES WITH A RING GROOVE CLEANER. IF THERE ISN'T ONE AVAILABLE, BREAK ONE OF THE OLD RINGS IN TWO AND GRIND ONE END FLAT AND THE OTHER SHARP.



22. PUT RINGS INTO THE CYLINDER, THEN PUSH THE RING DOWN INTO THE CYLINDER TO THE BOTTOM OF THE RING TRAVEL.

JOB STEPS

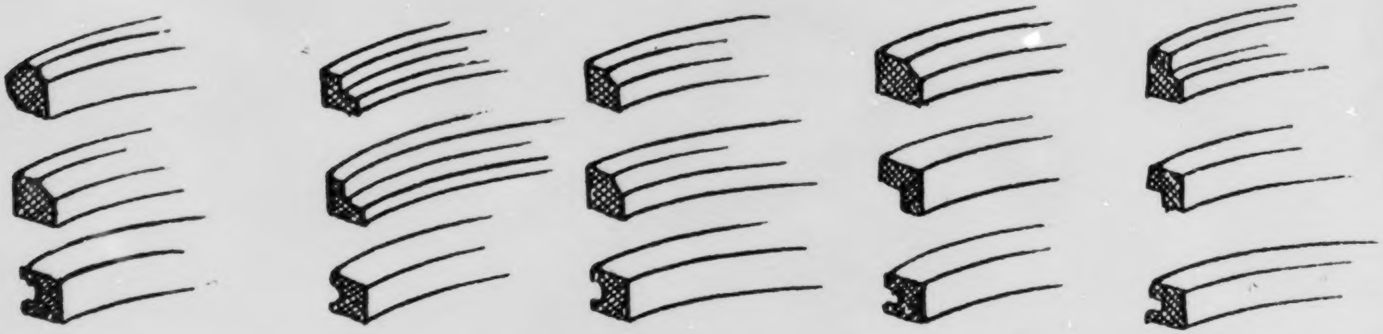
23. NOW YOU SHOULD CHECK THE RING END GAP. THIS INFORMATION SHOULD BE IN THE MANUAL. IF THERE ISN'T A MANUAL AVAILABLE, A GOOD RULE OF THUMB WOULD BE TO FIGURE .003 MINIMUM END GAP PER INCH OF DIAMETER OF THE RING SAMPLE. (2 INCH RING .006 GAP, 2 1/2" RING .009, 3" RING .009).



JOB STEPS

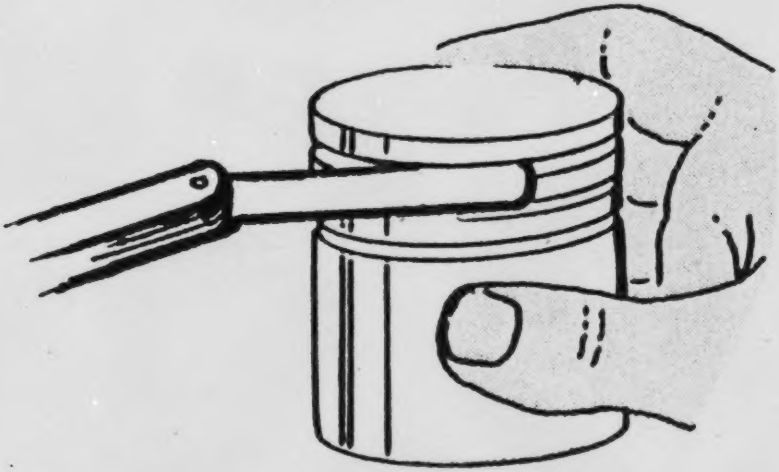
24. IF END GAP IS OK, CLEAN THE ENTIRE ENGINE. IF NOT, CHECK WITH YOUR INSTRUCTOR.

25. PUT ROD AND PISTON IN VISE (CLAMP VERY LIGHTLY ON ROD). INSTALL THE RINGS ON THE PISTON AND BE SURE THAT THEY ARE IN THE PROPER GROOVE AND INSTALLED IN THE RIGHT WAY UP. SEE *B & S MANUAL IV*, SECTION 9, PAGE 3, FIGURE 7 AND 8.



JOB STEPS

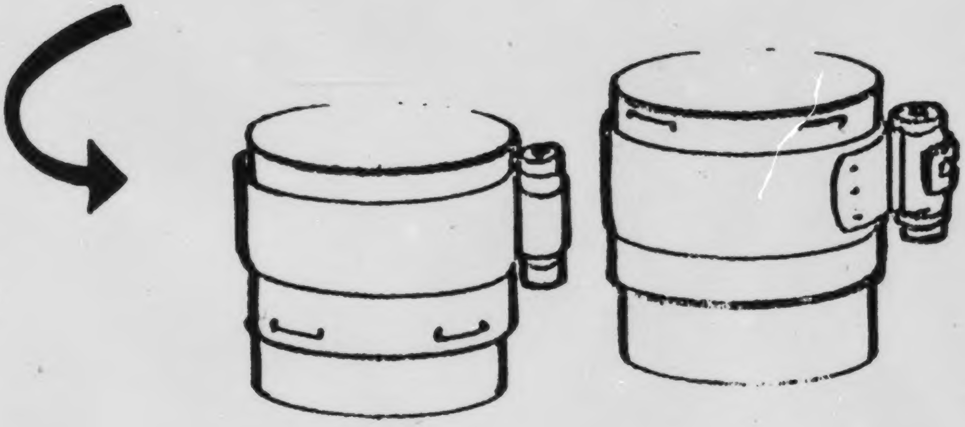
26. NOW YOU ARE READY TO CHECK RING LAND CLEARANCE. (READ IN REPAIR MANUAL IV, SECTION 9, PAGE 2 BEFORE CHECKING). THE RING LAND CLEARANCE IS CHECKED BY PLACING THE PROPER FEELER GAUGE BETWEEN THE RING AND RING LAND. IF CLEARANCE IS GREATER THAN CALLED FOR THE PISTON WILL HAVE TO BE REPLACED. IF RING LAND CLEARANCE IS OK, GO ON TO THE NEXT STEP.



JOB STEPS

27. NOW YOU WILL PUT A LIGHT COATING OF OIL ON THE PISTON RINGS AND PISTON SKIRT. BE SURE TO STAGGER RING END GAPS.

28. NOW PUT THE PISTON RING COMPRESSOR ON PISTON. REFER TO B & S MANUAL IV, SECTION 9, PAGE 3, FIGURE 8. READ PAGES 3 AND 4.



JOB STEPS

29. NOW COAT THE MAG SIDE MAIN JOURNAL OF THE CRANKSHAFT WITH OIL OR LUBRIPLATE, AND INSTALL CRANKSHAFT IN THE BLOCK.

30. NOW YOU WILL INSTALL THE ROD AND PISTON INTO THE CYLINDER WITH THE ROD FACING IN THE PROPER DIRECTION. GENTLY PUSH THE PISTON AND ROD DOWN INTO THE CYLINDER. SEE B & S MANUAL IV, SECTION 9, PAGE 4, FIGURE 10.

31. PUSH PISTON DOWNWARD AND GUIDE THE ROD TO THE CRANKSHAFT THROW. BE SURE TO INSTALL THE ROD CAP SO THAT THE MATCH MARKS LINE UP. BE SURE THE OIL SPLASHER, IF USED ON THE ROD, IS ON BEFORE INSTALLING BOLTS OR NUTS. SEE B & S MANUAL IV, SECTION 9, PAGE 4, FIGURE 11.

JOB STEPS

32. TORQUE THE ROD BOLTS OR NUTS. SEE MANUAL FOR SPECIFICATIONS. BE SURE TO BEND ROD LOCK TO BOLT HEAD, IF LOCK IS USED. THE ROD BOLTS AND NUTS ARE SOMETIMES CALLED CAP SCREWS.

33. HAVE YOUR INSTRUCTOR INSPECT ROD BOLTS AND BENT ROD LOCKS.

34. NOW IF THE CAMSHAFT WAS TAKEN OUT YOU MUST INSTALL THE LIFTERS AND CAMSHAFT AND RETIME TO CRANK, AFTER INSTALLING CAM AND ALIGNING THE TIMING MARKS. SEE B & S MANUAL, SECTION 10, PAGE 3.

35. YOU SHOULD CHECK THE VALVE TO PISTON TIMING IN CASE THE CAM OR CRANKSHAFT IS MARKED WRONG.

JOB STEPS

36. TO CHECK VALVE TIMING, ROTATE CRANKSHAFT TO T.D.C. BETWEEN EXHAUST STROKE AND INTAKE STROKE BY SLOWLY TURNING THE CRANKSHAFT BACK AND FORTH. THE PISTON SHOULD REMAIN AT TOP DEAD CENTER AND BOTH VALVES SHOULD JUST BARELY MOVE. (IF BOTH VALVES DON'T MOVE THEN YOU MAY BE ON THE COMPRESSION STROKE AND WILL HAVE TO ROTATE THE CRANKSHAFT ONE MORE COMPLETE REVOLUTION TO T.D.C.). SEE IF BOTH VALVES MOVE AND THE PISTON IS NOT MOVING. THIS STEP IS TO PROVE THAT THE ENGINE IS IN PROPER VALVE TO PISTON TIME.

37. REMOVE THE CRANKSHAFT SEAL FROM THE SUMP AND CLEAN UP THE SUMP FOR INSTALLATION. SEE B & S MANUAL IV, SECTION 10, PAGE 4, FIGURE 10, 11, AND 12. REFER TO MOD 7501 01 001.

JOB STEPS

38. INSTALL THE NEW GASKET ON THE BLOCK. (IF THE GASKET IS WRINKLED OR SHRUNK JUST SOAK IT IN WARM WATER FOR A MINUTE). THEN LAY IT ON BLOCK. BE SURE ALIGNMENT DOWELS ARE IN PLACE TO HOLD THE GASKET.

39. PUT OIL OR LUBRIPLATE ON CAMSHAFT BEARING AND CRANKSHAFT BEARING SURFACE. IF THE ENGINE HAS A MECHANICAL GOVERNOR OR OIL SLINGER (B & S) BE SURE IT IS INSTALLED AT THIS TIME.

40. INSTALL THE SUMP ON THE CRANKSHAFT AND CAREFULLY PUSH THE SUMP DOWN AND BE SURE TO ALIGN CAMSHAFT WITH BEARING HOLE. DON'T FORCE THE SUMP DOWN. (IF THE ENGINE IS A TECUMSEH AND IT HAS

JOB STEPS

A MECHANICAL GOVERNOR BE SURE THAT THE NYLON GOVERNOR GEAR IS IN MESH WITH THE CAM GEAR). YOU MAY HAVE TO TURN THE CRANKSHAFT BACK AND FORTH TO GET THE GEAR TO MESH. THEN GENTLY PUSH THE SUMP THE REST OF THE WAY DOWN.

41. INSTALL SUMP BOLTS AND TORQUE. SEE MANUAL.

42. INSTALL OIL SEAL IN SUMP. SEE MOD 7501 01 001.

43. INSTALL NEW HEAD GASKET. SEE MOD 7501 01 003.

44. INSTALL HEAD AND TORQUE. CHECK MANUAL.

TURN PAGE →

JOB STEPS

45. INSTALL AIR HOUSING.

46. FILL ENGINE WITH OIL AND FUEL.

47. START AND ADJUST. CHECK FOR OIL LEAKS THEN SHUT OFF AND CHECK TORQUE ON HEAD BOLTS.

48. CLEAN UP FOR CUSTOMER PICK-UP.

49. HAVE THE INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: SMALL ENGINE

capital area career center

module: 7501 01 017 7 **date:** 5-77 **level:** I

skill title: HOW TO CHECK CRANKSHAFT END PLAY

developed & written by: DON FOSTER AND DWIGHT SMITH

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO CHECK THE END PLAY OF AN ENGINE CRANKSHAFT.

AND IN ORDER TO DO THIS YOU WILL NEED:

A TWO OR FOUR CYCLE ENGINE

BRIGGS AND STRATTON REPAIR MANUAL IV

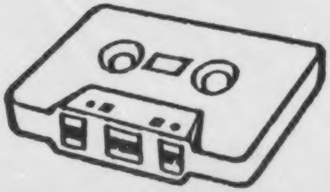
DIAL INDICATOR KIT

TOOLS

SAFETY GLASSES

WE WILL KNOW THAT YOU CAN DO THIS WHEN:

YOU HAVE MEASURED THE END PLAY OF A CRANKSHAFT AND TOLD YOUR INSTRUCTOR WHAT IT IS.



A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

WHAT IS A CRANKSHAFT END PLAY?

CRANKSHAFT END PLAY IS THE CLEARANCE BETWEEN THE BLOCK AND THE SUMP AND THE CRANKSHAFT - THROWS.

GET THE CUTAWAY BRIGGS AND STRATTON ENGINE DISPLAY III. IF YOU PUSH UP ON THE BOTTOM END OF THE CRANKSHAFT (THE POWER TAKE OFF END OR PTO) AND THEN PULL DOWN ON IT, YOU'LL SEE THAT THE MOVEMENT IS CRANKSHAFT END PLAY. SHOW YOUR INSTRUCTOR WHERE THIS END PLAY IS ON THE DISPLAY ENGINE.

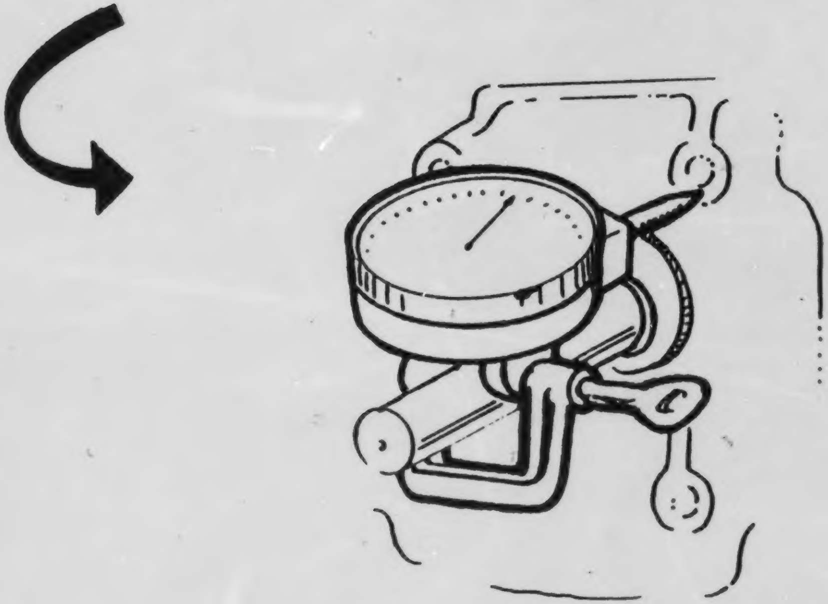
ENGINE'S NEED END PLAY TO HELP LOWER THE FRICTION BETWEEN THE BLOCK AND THE SUMP AND THE CRANKSHAFT. IF THERE IS NOT ENOUGH END PLAY, THE ENGINE WILL SEIZE UP AND DIE.

JOB STEPS

1. GET DISPLAY NUMBER III AND TAKE IT TO THE WORK AREA.

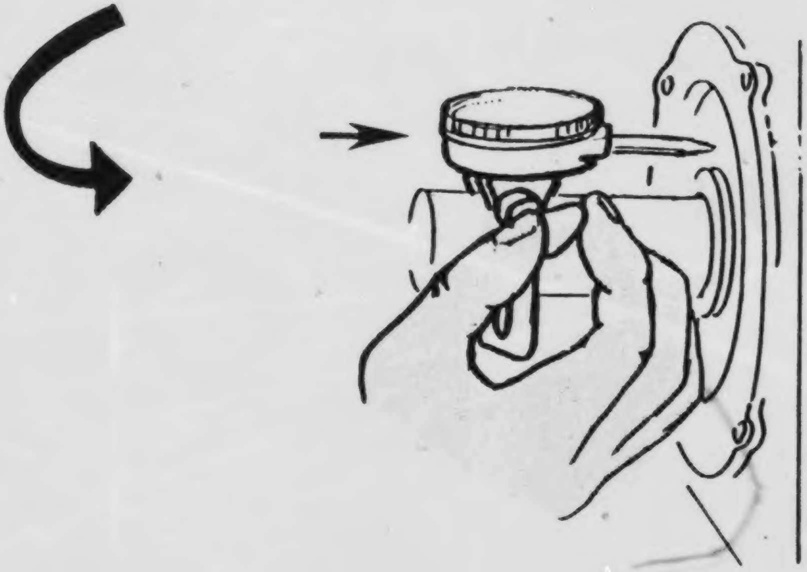
2. GET THE END PLAY GAUGE KIT FROM THE TOOL CRIB.

3. PUT THE END PLAY GAUGE KIT ON THE PTO END OF THE CRANKSHAFT. CHECK TO BE SURE YOU HAVE PUT IT ON CORRECTLY.



JOB STEPS

4. TIGHTEN THE DIAL INDICATOR ONTO THE CRANKSHAFT AND PUSH IT TOWARD THE BLOCK. DO THIS UNTIL THE NEEDLE ON THE DIAL MOVES A FEW THOUSANDTHS OF AN INCH. FINISH TIGHTENING THE CLAMP.



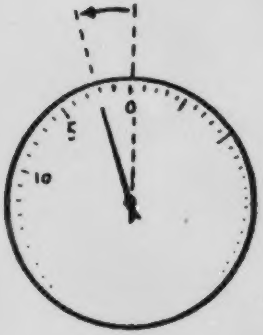
5. PUSH THE CRANKSHAFT ALL THE WAY TOWARDS THE MAG SIDE OF THE ENGINE.

JOB STEPS

6. TURN THE DIAL ON THE DIAL INDICATOR UNTIL IT READS "0" (ZERO). THIS IS CALLED "ZEROING" THE DIAL INDICATOR.

7. PUSH THE CRANKSHAFT ALL THE WAY TOWARDS THE PTO SIDE OF THE ENGINE.

8. COUNT HOW MANY THOUSANDTHS OF AN INCH THE NEEDLE HAS MOVED. (.001 EQUALS ONE THOUSANDTH). THIS IS THE AMOUNT OF END PLAY.



GOOD WORK! YOU JUST MEASURED THE CRANKSHAFT END PLAY.

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 01 021 7 **date:** 5/77 **level:** I

skill title: REMOVE CRANKSHAFT FROM A 2- OR 4- CYCLE ENGINE

developed & written by: ERIC SCHWING

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE THE CRANKSHAFT FROM A SMALL ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

A 2 OR 4 CYCLE ENGINE
A SET OF SOCKET WRENCHES
A SET OF SCREWDRIVERS
A RUBBER MALLET
A LONG PUNCH
A FILE OR EMERY CLOTH
REPAIR INSTRUCTIONS FOR THE ENGINE YOU HAVE

WE WILL KNOW THAT YOU CAN DO IT WHEN:

YOU CAN REMOVE THE CRANKSHAFT FROM A SMALL ENGINE WITHOUT DAMAGING ANY OF THE PARTS, AND REPLACE IT SO THAT IT IS SET TO SPECIFICATIONS AND TURNS SMOOTHLY WHEN RUNNING.

A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

THE DIRECTIONS IN THIS MOD APPLY TO SEVERAL TYPES OF SMALL ENGINES. THE ENGINE YOU ARE WORKING ON MAY BE DIFFERENT. BEFORE YOU BEGIN, MAKE SURE THAT YOU HAVE READ THE REPAIR INSTRUCTIONS FOR THE ENGINE THAT YOU HAVE. TRY TO FIND ANY DIFFERENCES IN THE REPAIR INSTRUCTIONS AND THE MOD. TAKE YOUR TIME. ASK QUESTIONS. WHEN YOU BEGIN, REMEMBER YOU SHOULD NEVER FORCE ANY PARTS. GET YOUR INSTRUCTOR TO HELP IF YOU HAVE ANY TROUBLE.

YOU MUST KNOW WHEN THE ENGINE HAS BEEN TAKEN APART ENOUGH TO ALLOW YOU TO REMOVE THE CRANKSHAFT. LOOK IN THE REPAIR MANUAL AND THE MODS. ASK YOUR INSTRUCTOR IF YOU HAVE ANY QUESTIONS.

INFORMATION

IF THE ENGINE YOU ARE WORKING ON HAS BALL BEARINGS, YOU MUST FIND THE DIRECTIONS FOR REMOVING THE MAGNETO. LOOK IN THE MOD AND IN THE REPAIR INSTRUCTIONS.

IF YOU ARE READY TO REMOVE THE CRANKSHAFT, YOU HAVE TO KNOW IF YOU ARE WORKING WITH A CAST IRON OR ALUMINUM ENGINE. THE METHOD OF REMOVING THE CRANKSHAFT IS DIFFERENT FOR EACH TYPE OF ENGINE. LOOK AT THE JOB STEPS AND FIND THE ONES THAT GO WITH THE KIND OF ENGINE YOU ARE WORKING ON. READ THE DIRECTIONS CAREFULLY, AND MAKE SURE THAT YOU HAVE ALL THE TOOLS YOU NEED BEFORE YOU BEGIN.

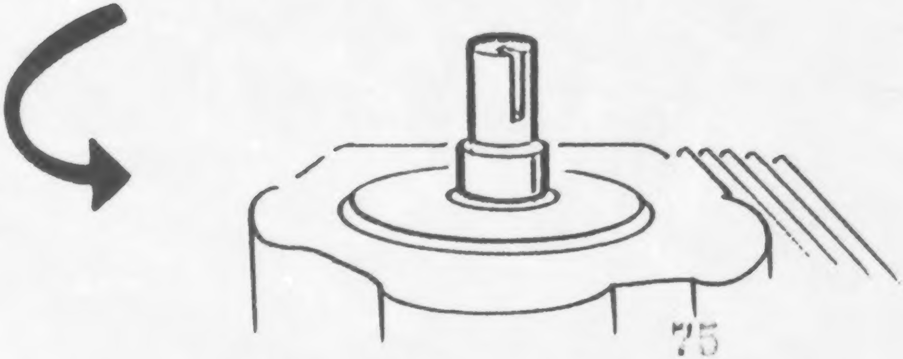
1

JOB STEPS

ALUMINUM ENGINES

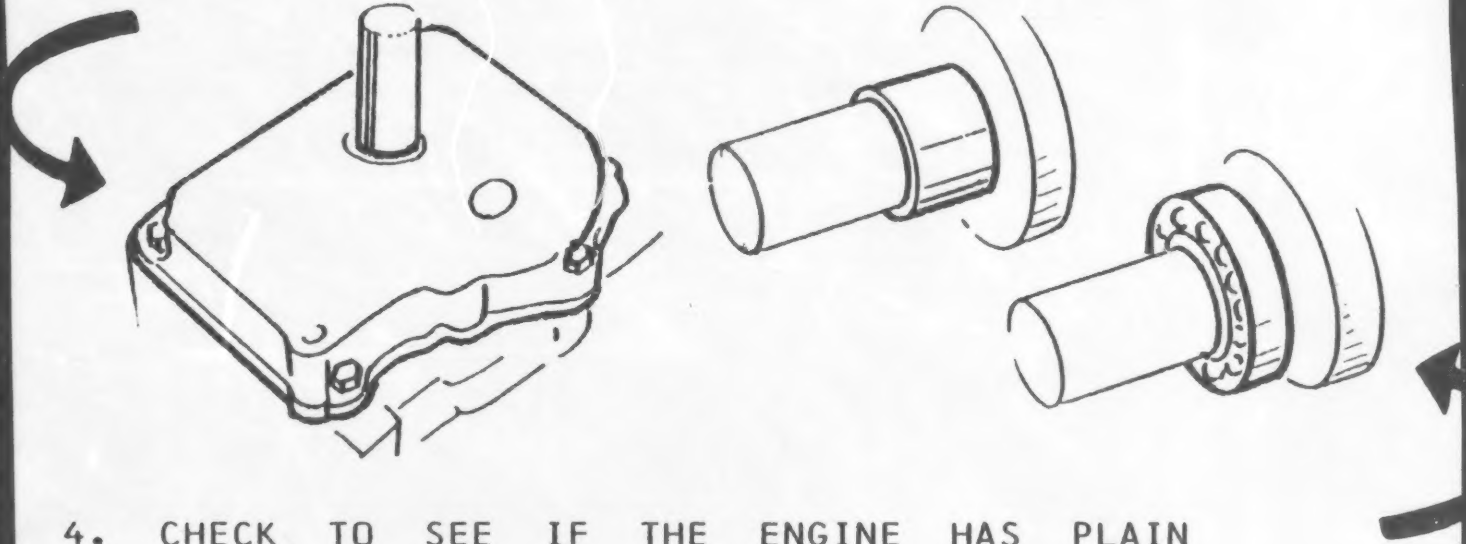
1. GET YOUR EQUIPMENT. YOU WILL NEED:
   A FILE OR AN EMERY CLOTH
   A SOCKET WRENCH SET
   A RUBBER MALLET

2. LOOK AT THE END OF THE CRANKSHAFT STICKING OUT OF THE ENGINE. THIS IS THE POWER TAKE OFF END. CHECK TO SEE IF THERE ARE RUST OR BURRS ON THIS END. IF THERE IS, YOU MUST REMOVE IT WITH THE FILE OR THE EMERY CLOTH. MAKE SURE THE SHAFT IS CLEAN AND SMOOTH.



JOB STEPS

3. TAKE OFF THE BOLTS HOLDING ON THE CRANKCASE COVER. PUT THEM IN A SAFE PLACE. IF THE COVER STICKS, YOU CAN TAP IT LIGHTLY WITH THE RUBBER MALLET TO LOOSEN THE SEAL. PULL THE COVER OFF CAREFULLY OVER THE END OF THE CRANKSHAFT.

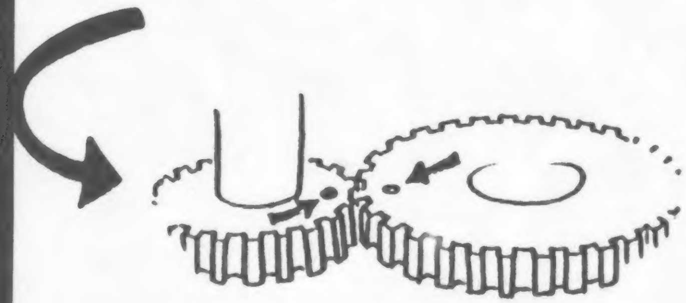


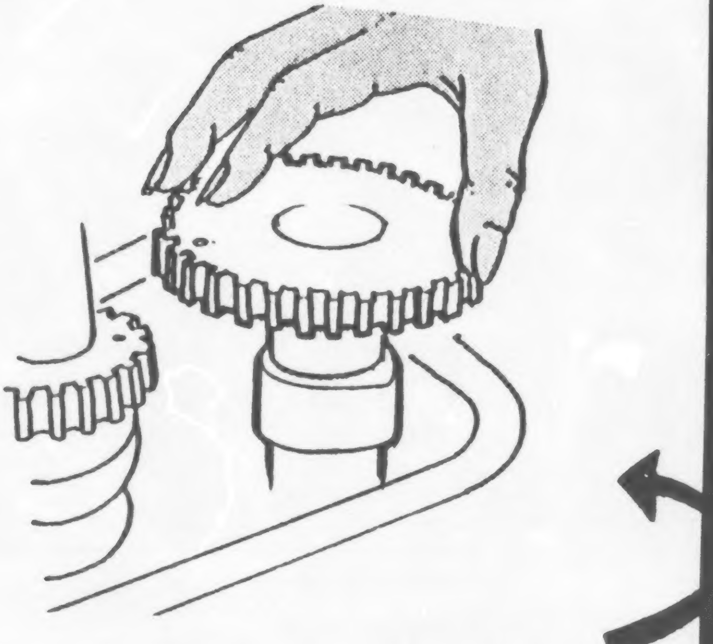
4. CHECK TO SEE IF THE ENGINE HAS PLAIN BEARINGS OR BALL BEARINGS ON THE POWER TAKE OFF SIDE. FIND AND FOLLOW THE SET OF DIRECTIONS THAT GO WITH THE TYPE OF BEARINGS THAT YOUR ENGINE HAS.

JOB STEPS

PLAIN BEARINGS

5. TURN THE CRANKSHAFT UNTIL THE TIMING MARKS ON THE CRANKSHAFT AND THE CAM GEAR ARE LINED UP.



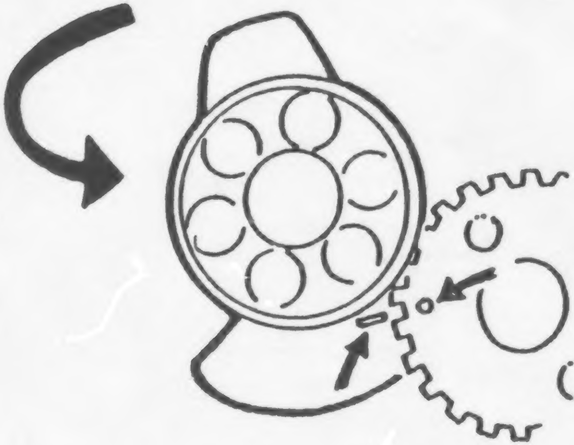


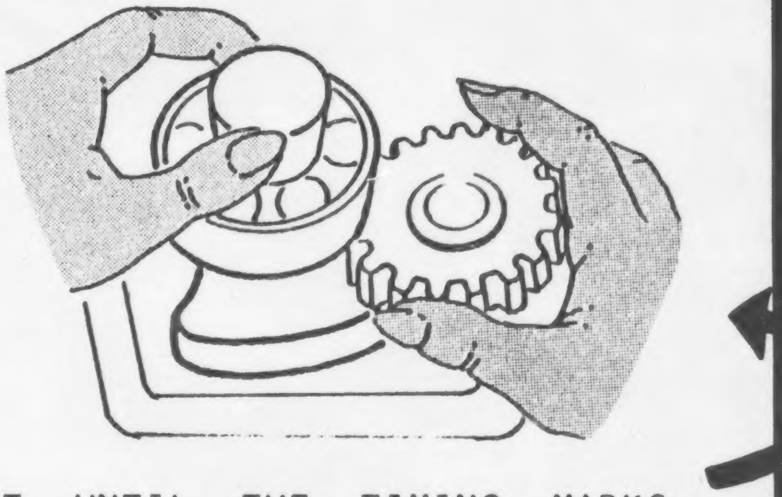
6. CAREFULLY PULL THE CAM GEAR OUT. NOW YOU CAN CAREFULLY PULL THE CRANKSHAFT OUT.

JOB STEPS

BALL BEARINGS

5. YOU WOULD NOT BE ABLE TO SEE A TIMING MARK IF IT WAS PUT ON THE CRANK GEAR IN AN ENGINE WITH BALL BEARINGS. THE BEARING WOULD BE IN THE WAY. FIND THE MARK ON THE CRANKSHAFT COUNTERWEIGHT.





6. TURN THE CRANKSHAFT UNTIL THE TIMING MARKS ON THE CAM GEAR AND COUNTERWEIGHT ARE LINED UP. YOU CAN NOW PULL THE CAM GEAR AND CRANKSHAFT OUT AT THE SAME TIME. DO THIS CAREFULLY, SO THAT YOU DO NOT DAMAGE THE PARTS.

JOB STEPS

CAST IRON ENGINES

1. GET YOUR EQUIPMENT. YOU WILL NEED:

   A FILE OR AN EMERY CLOTH
   A SOCKET WRENCH SET
   A RUBBER MALLET

   IF THE ENGINE HAS BALL BEARINGS YOU WILL ALSO NEED:

   A LONG PUNCH

2. CHECK THE POWER TAKE OFF END OF THE CRANKSHAFT STICKING OUT FROM THE ENGINE. IT MUST BE CLEAN AND SMOOTH. USE THE EMERY CLOTH AND FILE TO MAKE SURE THAT THERE ARE NO RUST OR BURRS ON THE SHAFT. TAKE OUT THE BOLTS HOLDING THE CRANK COVER.

JOB STEPS

3. PULL THE COVER OFF OVER THE END OF THE SHAFT. IF THE COVER STICKS TO THE ENGINE YOU CAN TAP IT LIGHTLY WITH THE RUBBER MALLET TO LOOSEN THE SEAL.

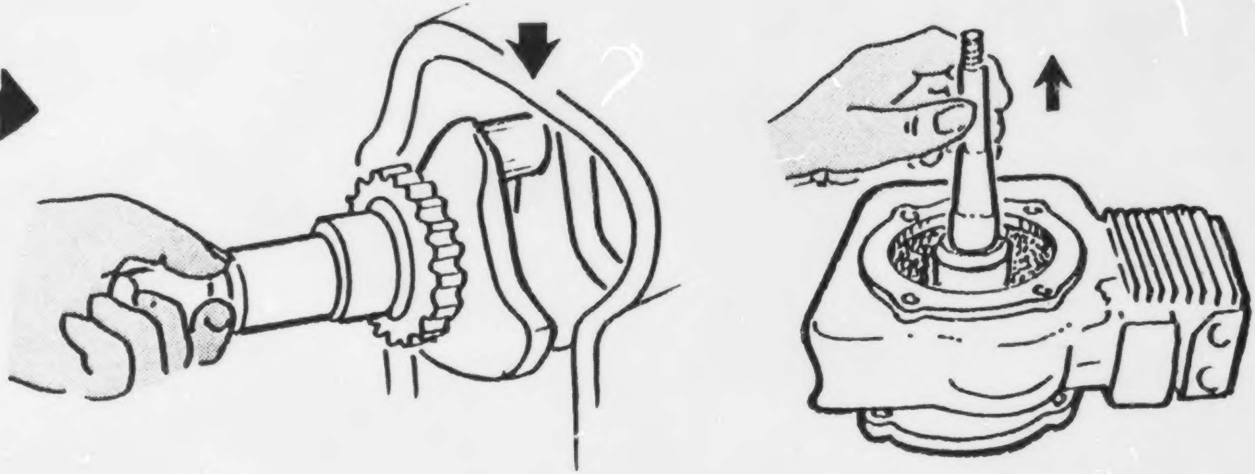
4. LOOK TO SEE IF THE ENGINE HAS PLAIN BEARINGS OR BALL BEARINGS ON THE POWER TAKE OFF SIDE. FIND AND FOLLOW THE DIRECTIONS THAT GO WITH THE TYPE OF BEARINGS THAT YOUR ENGINE HAS.

PLAIN BEARINGS

5. TURN THE CRANKSHAFT UNTIL THE CRANKPIN POINTS UP AND TO THE REAR OF THE ENGINE. IF YOU HAVE IT IN THE RIGHT PLACE, YOU WILL BE ABLE TO PULL THE SHAFT OUT

JOB STEPS

5. EASILY. YOU MAY HAVE TO WIGGLE THE SHAFT A LITTLE TO GET IT IN THE RIGHT POSITION. DO NOT DAMAGE THE SHAFT BY FORCING IT.



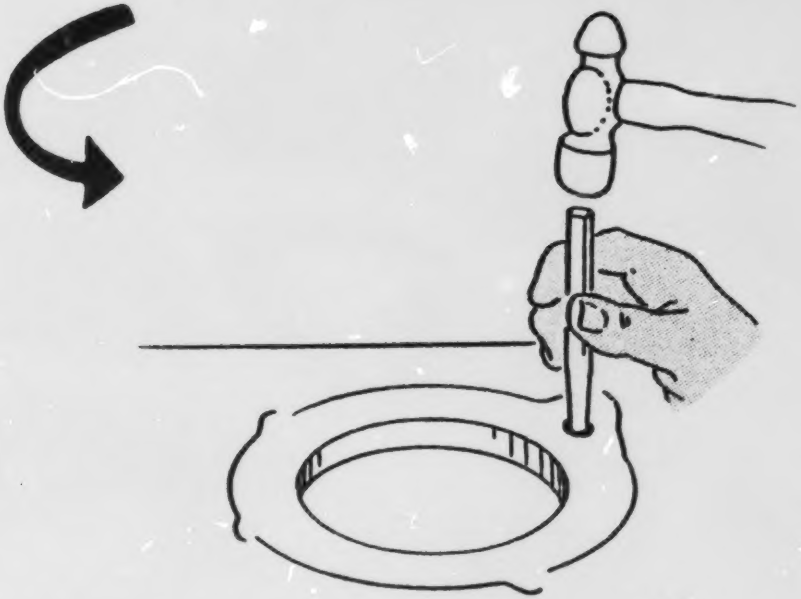
BALL BEARINGS

5. SOME ENGINES HAVE BALL BEARINGS ON THE POWER TAKE OFF SIDE OF THE CRANKSHAFT. ON THESE ENGINES YOU HAVE TO TAKE THE CRANKSHAFT OUT FROM THE MAGNETO SIDE.

JOB STEPS

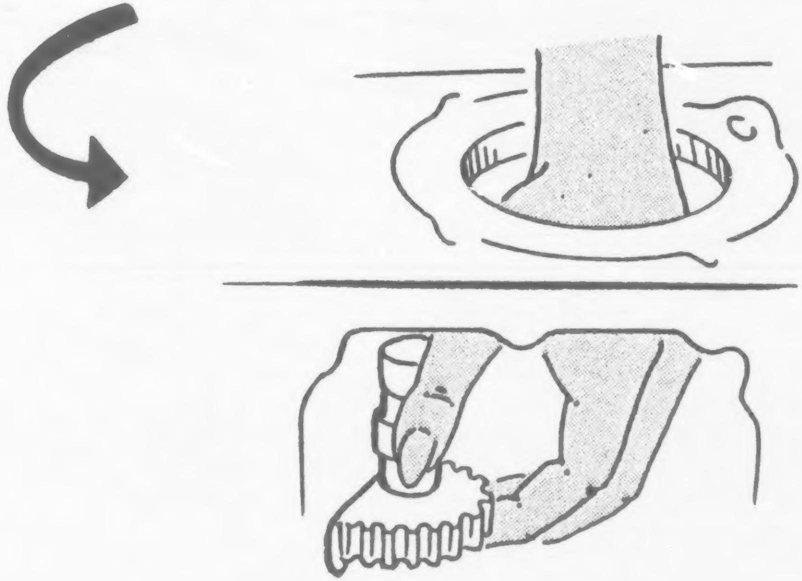
6. FIND THE DIRECTIONS FOR REMOVING THE MAGNETO AND FOLLOW THEM CAREFULLY.

7. USE A LONG PUNCH TO VERY CAREFULLY TAP THE CAM GEAR SHAFT INTO THE ENGINE FROM THE POWER TAKE OFF SIDE. DO NOT DAMAGE THE SHAFT. DRIVE THE SHAFT ALL THE WAY OUT OF THE ENGINE.



JOB STEPS

8. THE PUNCH WILL HOLD THE CAM GEAR. WHEN YOU PULL THE PUNCH OUT BE SURE TO REACH IN AND HOLD THE GEAR SO THAT IT DOES NOT FALL AND GET NICKED. PUSH THE GEAR INTO THE SPACE IN THE CRANKCASE WHERE IT WILL BE AWAY FROM THE CRANK GEAR.



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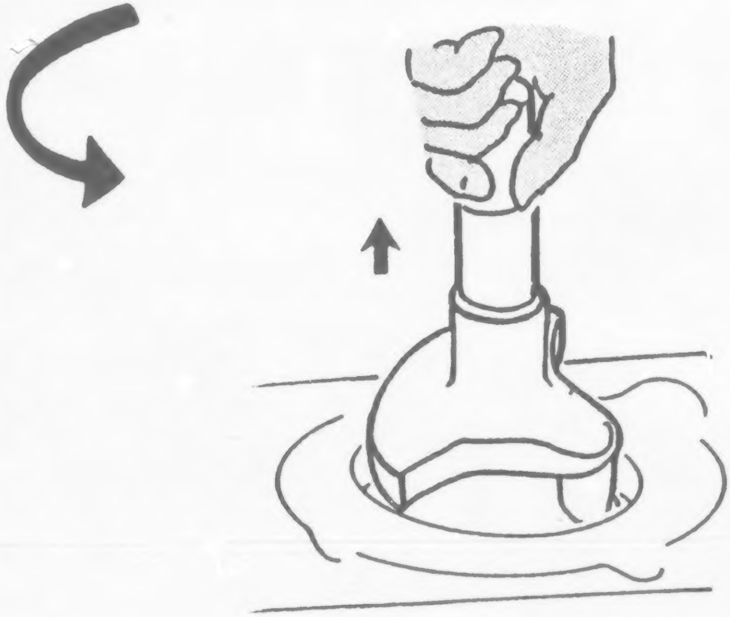
JOB STEPS

9. YOU CAN NOW PULL THE CRANKSHAFT OUT FROM THE MAGNETO SIDE.



NOW YOU ARE READY TO INSPECT AND MIKE THE CRANKSHAFT (MODULE 7501 01 022 7).

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 01 022 7 **date:** 5/77 **level:** I

skill title: INSPECT AND MIKE CRANKSHAFT OF A 2- OR 4-CYCLE ENGINE

developed & written by: ERIC SCHWING

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO INSPECT A CRANKSHAFT TO FIND IF IT IS DAMAGED OR WORN, AND TO MEASURE THE JOURNALS TO SEE IF THEY ARE WORN.

AND IN ORDER TO DO THIS YOU WILL NEED:

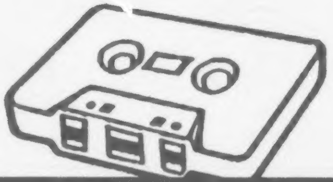
A CRANKSHAFT FROM A SMALL ENGINE

A MICROMETER

THE REPAIR MANUAL FOR THE ENGINE THAT THE CRANKSHAFT CAME FROM.

WE WILL KNOW THAT YOU CAN DO IT WHEN:

YOU CAN MEASURE THE CRANKSHAFT JOURNALS TO CHECK SPECIFICATIONS AND CAN SHOW DAMAGED OR WORN PARTS TO YOUR INSTRUCTOR.



A TAPE OF THIS MODULE IS AVAILABLE

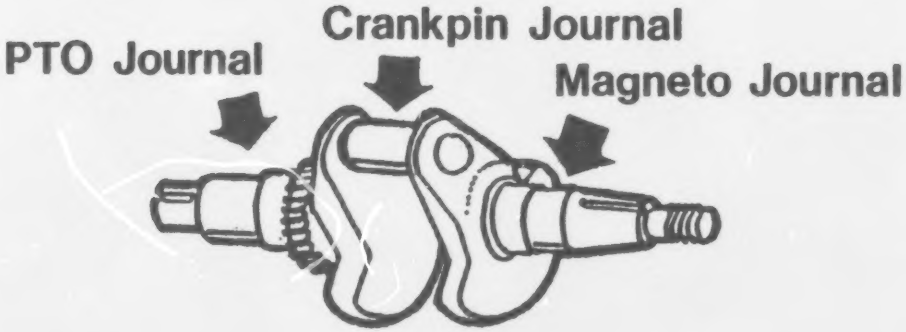
INFORMATION

YOU WILL NEED TO KNOW HOW TO USE A MICROMETER (MIKE). REMEMBER THAT MICROMETERS ARE EXPENSIVE AND DELICATE. DROPPING ONE COULD EASILY RUIN IT. BE CAREFUL!

WHEN YOU HAVE REMOVED THE CRANKSHAFT FROM THE ENGINE YOU WILL WANT TO CHECK IT FOR WEAR. FIRST LOOK AT THE GEAR TEETH. THERE SHOULD BE NO MISSING OR BROKEN TEETH. LOOK AT THE KEYWAY PLUNGER AND AT THE THREADS ON THE END OF THE SHAFT. NONE OF THE PARTS SHOULD BE DAMAGED.

THE ILLUSTRATION SHOWS THREE AREAS ON THE CRANKSHAFT WHERE BEARINGS OR THE CONNECTING ROD MEET THE SHAFT. THESE AREAS ARE CALLED JOURNALS. LOOK AT THE ILLUSTRATION AND FIND THE MAGNETO JOURNAL, THE CRANKPIN JOURNAL, AND THE POWER TAKE OFF (P.T.O.) JOURNAL. →

INFORMATION



IF ANY OF THESE AREAS ARE WORN SMALLER THAN THE SIZES IN THE REPAIR MANUAL SPECIFICATIONS, THE CRANKSHAFT MUST BE REPLACED. LOOK AT THE TABLE BELOW. IT SHOWS THE SMALLEST SIZES ALLOWED FOR MANY TYPES OF BRIGGS AND STRATTON ENGINES. THESE SIZES ARE SOMETIMES CALLED REJECTION SIZES. FIND THE REJECTION SIZE FOR THE POWER TAKE OFF JOURNAL FOR AN ENGINE WITH MODEL NUMBER 80092. NOTE THAT THE POWER TAKE OFF JOURNAL IS CALLED THE DRIVE JOURNAL IN THIS TABLE. IF YOU MEASURED THE POWER TAKE

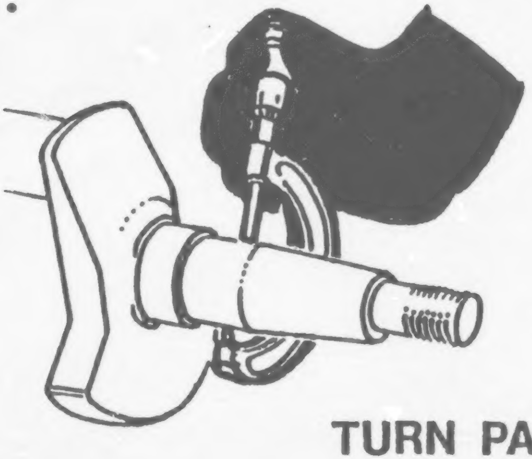
INFORMATION

OFF JOURNAL ON AN ENGINE WITH A SERIAL NUMBER OF 80092, AND IT WAS .9969, COULD YOU USE THE CRANKSHAFT? WHAT WOULD YOU DO IF YOU HAD A CRANKSHAFT FROM A 60000 SERIES ENGINE AND THE CRANKPIN JOURNAL WAS .8700, THE MAGNETO JOURNAL WAS .8733 AND THE POWER TAKE OFF JOURNAL WAS .8699?

JOB STEPS

1. LOOK IN THE REPAIR INSTRUCTIONS MANUAL FOR THE ENGINE YOU ARE WORKING ON AND FIND THE TABLE OF REJECTION SIZES FOR THE CRANKSHAFT. THERE IS ALSO A TABLE OF REJECTION SIZES FOR THE CAMSHAFT, SO BE SURE THAT YOU ARE USING THE RIGHT TABLE.

2. MEASURE THE MAGNETO JOURNAL SEVERAL TIMES WITH THE MICROMETER. TRY TO FIND THE SMALLEST PLACE ON THE JOURNAL, AND WRITE ALL THE MEASUREMENTS DOWN.



TURN PAGE →

JOB STEPS

3. CHECK THE SMALLEST NUMBER YOU HAVE WRITTEN WITH THE REJECTION SIZE GIVEN IN THE TABLE.

4. DO THE SAME THING WITH THE TWO OTHER JOURNALS. IS THE CRANKSHAFT STILL GOOD?

5. IF THE CRANKSHAFT WAS STILL GOOD, REPLACE IT ACCORDING TO MODULE 7501 01 023.

small engine repair

unit: STARTERS

capital area career center

module: 7501 03 001 7 **date:** 6/77 **level:** I

skill title: REMOVE AND REPLACE STARTERS

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE AND REPLACE A WIND - UP STARTER ASSEMBLY ON A SMALL ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

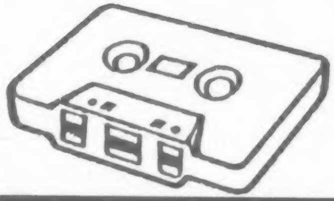
HAND TOOLS

ENGINE WITH A STARTER

SERVICE MANUAL

WE WILL KNOW YOU CAN DO IT WHEN:

THE STARTER ASSEMBLY IS PUT BACK ON THE ENGINE ACCORDING TO SERVICE MANUAL SPECIFICATIONS.



A TAPE OF THIS MODULE IS AVAILABLE.

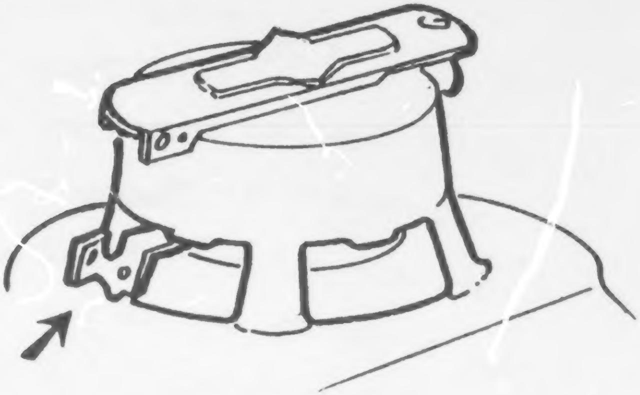
WORD GUIDE

IMPULSE - FORCE THAT TURNS OVER THE ENGINE.

INFORMATION

THERE ARE TWO MAIN TYPES OF STARTERS ON SMALL ENGINES, ONE IS AN IMPULSE OR A WIND-UP STARTER, AND THE OTHER IS A RE-WIND TYPE OF STARTER.

THE IMPULSE OR WIND-UP STARTER LOOKS LIKE THIS:



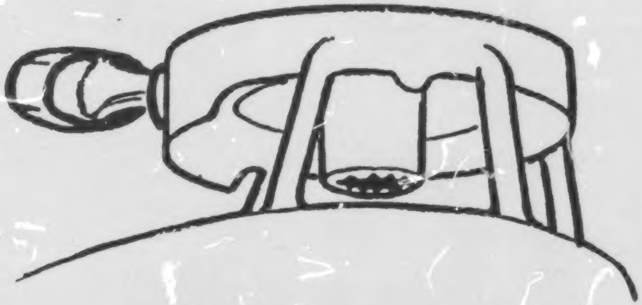
NOTE THE CONTROL LEVER. IT MUST BE ON "CRANK" TO WIND UP THE STARTER. WHEN THE LEVER IS ON "RELEASE", THE ENGINE WILL START.

WORD GUIDE

RECOIL - SPRING BACK.

INFORMATION

THE RE-WIND STARTER LOOKS LIKE THIS:

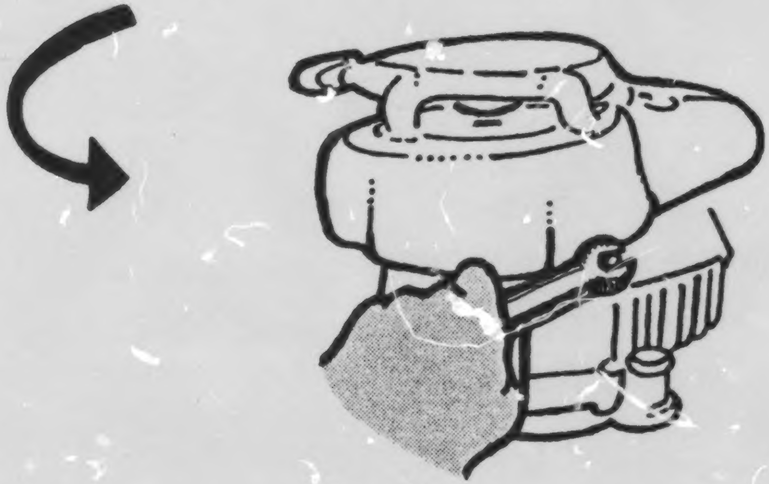


TO START THE ENGINE, YOU PULL ON THE STARTER ROPE. THE ROPE WILL RECOIL BACK INTO THE HOUSING.

JOB STEPS

1. GET YOUR EQUIPMENT AND SERVICE MANUAL. TAKE IT TO YOUR WORK AREA.

2. SINCE THE STARTER ASSEMBLY IS MOUNTED ON THE BLOWER HOUSING, FIRST REMOVE THE BLOWER HOUSING BOLTS. THERE ARE BOLTS IN 3 OR 4 PLACES.



3. NOW, LIFT THE HOUSING OFF THE ENGINE.

JOB STEPS

4. IF THE ENGINE HAS A RE-WIND STARTER, PULL OUT THE STARTER ROPE TO SEE IF IT IS WORN OUT. IF IT IS, TELL YOUR INSTRUCTOR.

5. RELEASE THE STARTER ROPE TO SEE IF IT GOES BACK INTO THE HOUSING.

6. PUT THE STARTER HOUSING BACK ONTO THE ENGINE.

7. REPLACE THE BOLTS, BE SURE THEY ARE TIGHT.

8. WIND UP THE STARTER SPRING AND RELEASE IT. SEE THAT THE STARTER WORKS PROPERLY (IF YOU HAVE A RE-WIND STARTER PULL THE ROPE AND RELEASE IT).

9. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: STARTERS

capital area career center

module: 7501 03 002 7 date: 6/77 level: I

skill title: REPLACE RECOIL SPRINGS

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

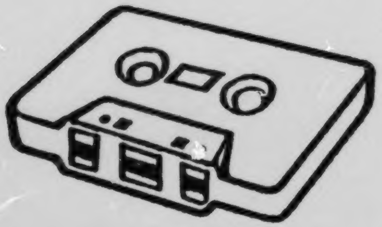
HOW TO REPLACE RECOIL SPRINGS ON A BRIGGS & STRATTON REWIND STARTER.

AND IN ORDER TO DO THIS YOU WILL NEED:

HAND TOOLS
BRIGGS & STRATTON ENGINE WITH REWIND STARTER
MODULE 7501 03 001 7
BRIGGS & STRATTON SERVICE MANUAL
3/4" SQUARE PIECE OF METAL

WE WILL KNOW YOU CAN DO IT WHEN:

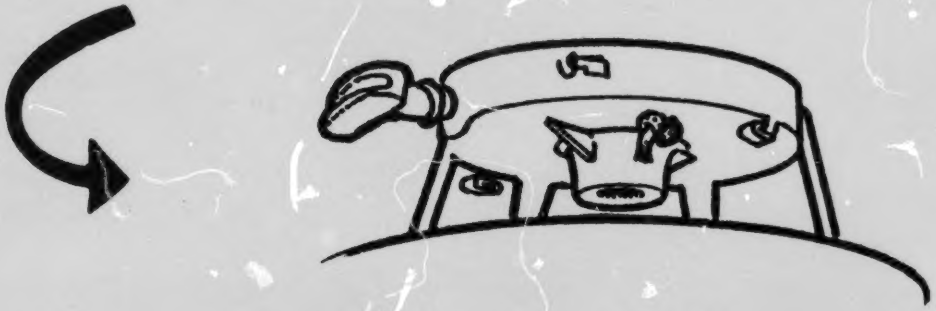
YOU HAVE REPLACED A RECOIL SPRING ON A BRIGGS & STRATTON REWIND STARTER SO IT WORKS ACCORDING TO SERVICE MANUAL SPECIFICATIONS.



A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

A BRIGGS & STRATTON REWIND STARTER ASSEMBLY LOOKS LIKE THIS:



THE STARTER RECOIL SPRING IS UNDER THE HOUSING. IF THIS SPRING IS WORN OUT OR BROKEN IT SHOULD BE REPLACED. IF YOU NEED INFORMATION ON OTHER TYPES OF STARTERS, LOOK IT UP IN THE SMALL ENGINE SERVICE MANUAL OR THE BRIGGS & STRATTON SERVICE MANUAL, SECTION 7.

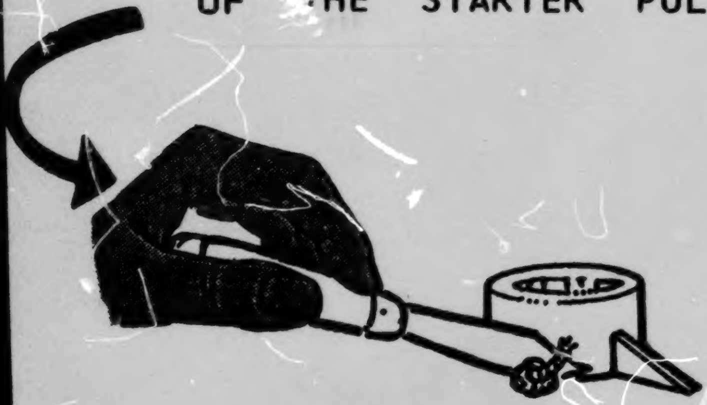
IF YOU HAVE A VERTICAL PULL STARTER, REFER TO SECTION 7, PAGE 5 IN THE BRIGGS & STRATTON MANUAL.

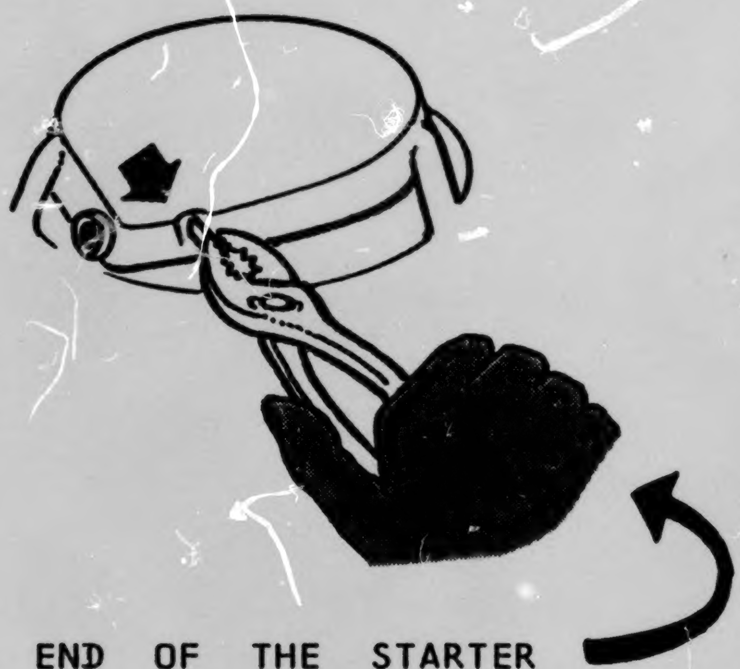
JOB STEPS

1. TAKE ALL THE EQUIPMENT TO THE WORK AREA.

2. REMOVE THE BLOWER HOUSING FROM THE ENGINE. SEE MODULE 7401 03 001 7.

3. CUT THE KNOT IN THE ROPE AT THE END OF THE STARTER PULLEY. REMOVE THE ROPE.

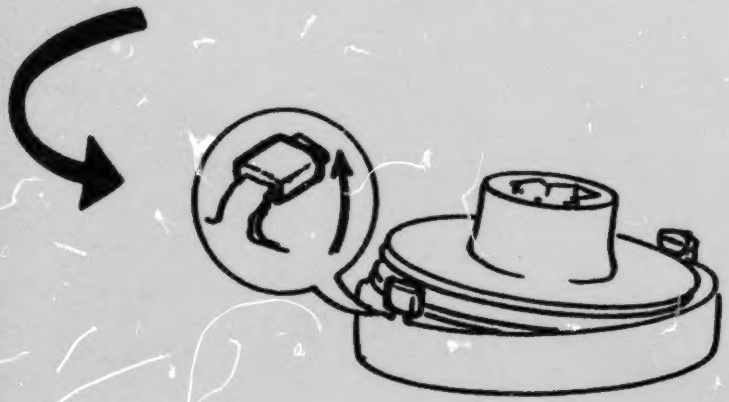


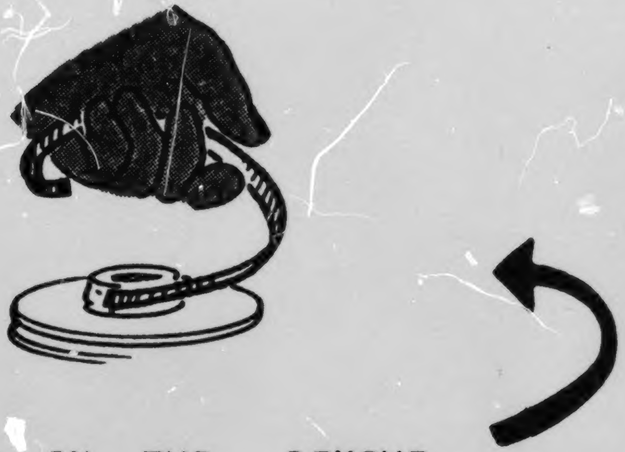


4. PULL OUT THE OUTER END OF THE STARTER SPRING AS FAR AS IT WILL GO.

JOB STEPS

5. BEND UP ONE OF THE NYLON BUMPER TANGS AND LIFT OUT THE STARTER PULLEY.





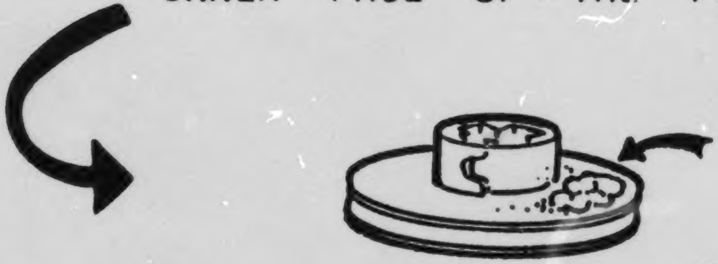
6. IF THE SPRING IS BROKEN IN TWO, REMOVE THE REST OF THE SPRING FROM THE PULLEY.

7. CLEAN THE STARTER SPRING IN SOLVENT.

8. THEN, CLEAN THE PULLEY. WIPE IT WITH A RAG BY PULLING THE RAG THROUGH THE PULLEY.

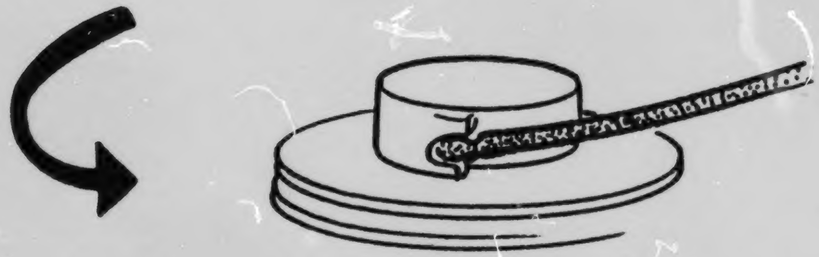
JOB STEPS

9. PUT A SMALL AMOUNT OF GREASE ON THE INNER FACE OF THE PULLEY.



10. STRAIGHTEN THE SPRING SO IT CAN BE INSTALLED MORE EASILY.

11. PUT ONE END OF THE SPRING IN THE STARTER HOUSING AND HOOK IT INTO THE SLOT.



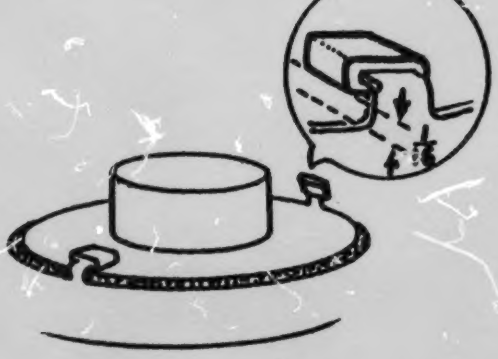
WORD GUIDE

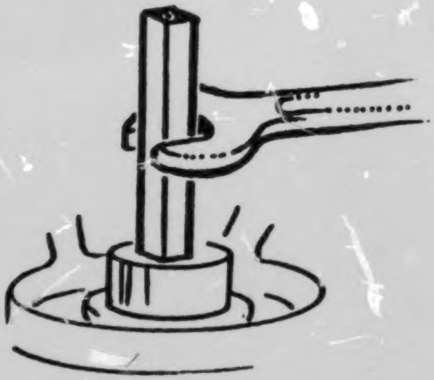
COUNTER-CLOCKWISE - TO THE LEFT.

JOB STEPS

12. REPLACE THE NYLON BUMPERS, IF THEY ARE WORN.

13. PUT THE PULLEY INTO THE BLOWER HOUSING AND BEND THE TANG DOWN. IT SHOULD BE 1/16 OF AN INCH FROM THE PULLEY.

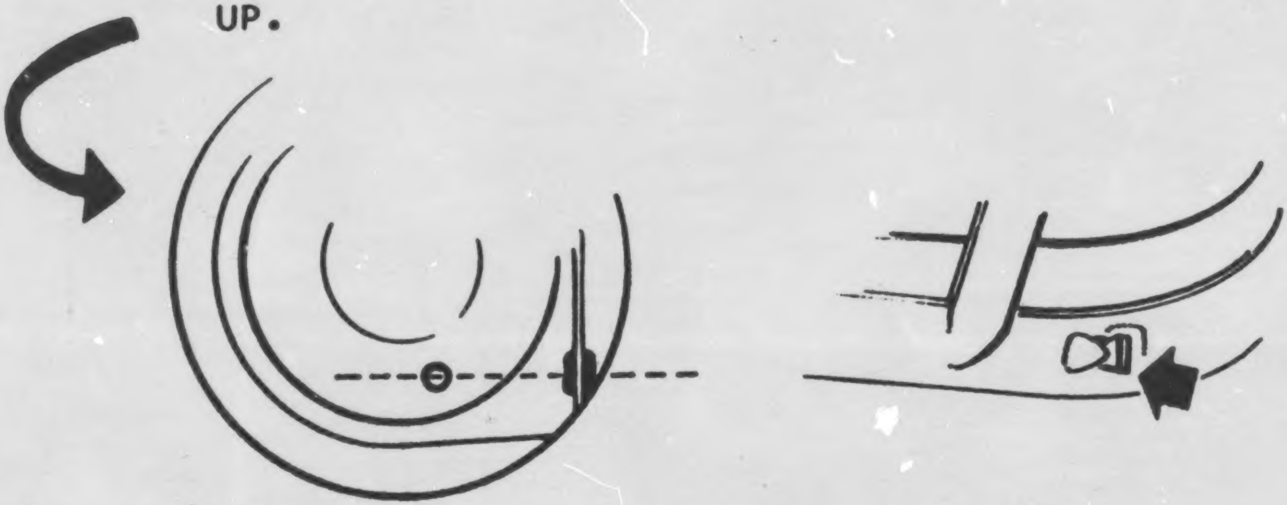




14. PUT A 3/4 INCH PIECE OF METAL INTO THE CENTER OF THE PULLEY HUB. WIND THE SPRING COUNTER-CLOCKWISE UNTIL THE SPRING IS WOUND TIGHT.

JOB STEPS

15. BACK OFF THE PULLEY ONE TURN UNTIL THE HOLE IN THE PULLEY, FOR THE ROPE KNOT, AND EYELET IN THE BLOWER HOUSING LINE UP.

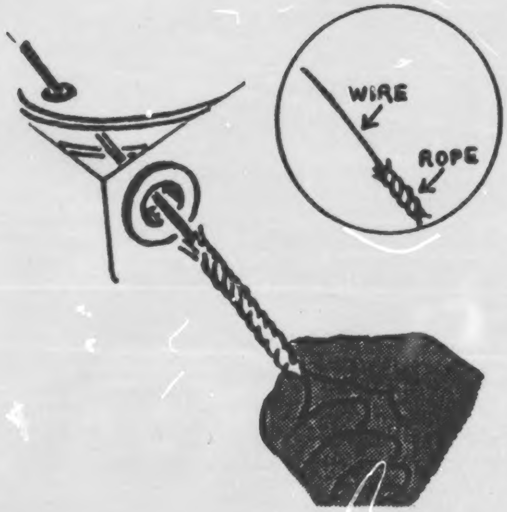


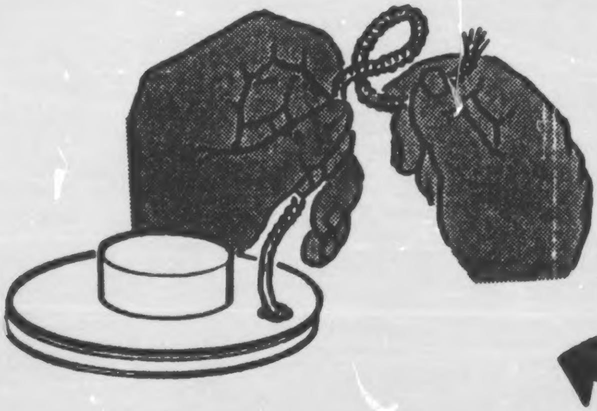
16. BE SURE THE SPRING IS LOCKED IN THE TAPERED PORTION OF THE HOLE.

17. IF THE OLD STARTER IS WORN, GET A NEW ONE.

JOB STEPS

18. PUT ONE END OF THE ROPE THROUGH THE HOLE IN THE STARTER HOUSING AND THE PULLEY. YOU CAN USE A PIECE OF WIRE TO GUIDE THE ROPE.





19. TIE THE END OF THE ROPE SO IT WILL NOT COME OUT OF THE HOLE.

20. WHEN YOU RELEASE THE PULLEY, THE ROPE WILL WIND INTO THE PULLEY AND HOUSING ASSEMBLY.

TURN PAGE →

JOB STEPS

21. PUT THE HOUSING ASSEMBLY BACK ONTO THE ENGINE.

22. CHECK THE OIL AND FUEL.

23. START THE ENGINE TO BE SURE IT WORKS PROPERLY.

24. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: STARTERS

capital area career center

module: 7501 03 003 7 **date:** 7/77 **level:** I

skill title: REMOVE AND REPLACE STARTER CLUTCHES

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

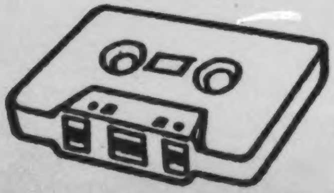
HOW TO DISASSEMBLE LATE MODEL STARTER CLUTCHES ON A BRIGGS & STRATTON ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

BRIGGS & STRATTON ENGINE WITH STARTER CLUTCHES
BRIGGS & STRATTON TOOL #19114
BRIGGS & STRATTON MANUAL

WE WILL KNOW YOU CAN DO THIS WHEN:

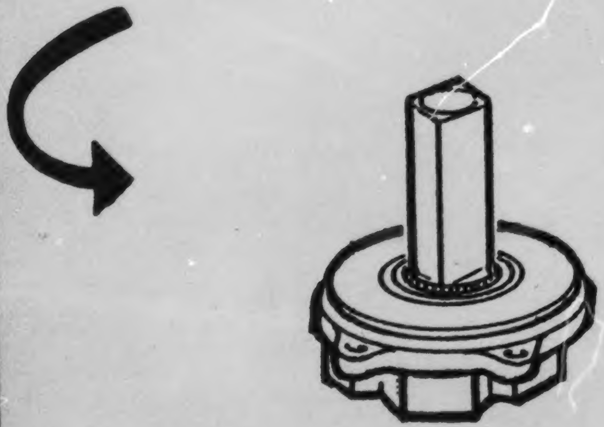
YOU HAVE TAKEN APART AND PUT BACK TOGETHER THE BRIGGS & STRATTON LATE MODEL STARTER CLUTCHES ACCORDING TO SERVICE MANUAL SPECIFICATIONS.



A TAPE OF THIS MODULE IS AVAILABLE.

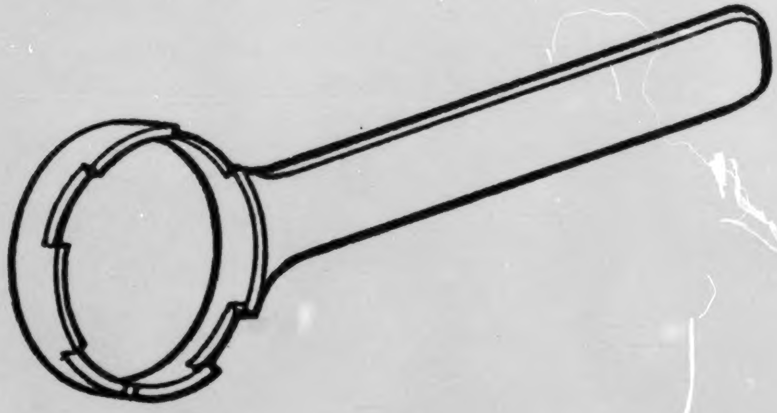
INFORMATION

BRIGGS & STRATTON MAKES AN EARLY AND LATE MODEL STARTER CLUTCH ASSEMBLY. THIS MODULE WILL TEACH YOU HOW TO SERVICE THE LATE MODEL CLUTCH ASSEMBLY. IF YOU HAVE AN EARLY MODEL, REFER TO PAGE 58 OF THE SMALL ENGINE SERVICE MANUAL. THE LATE MODEL CLUTCH LOOKS LIKE THIS:



INFORMATION

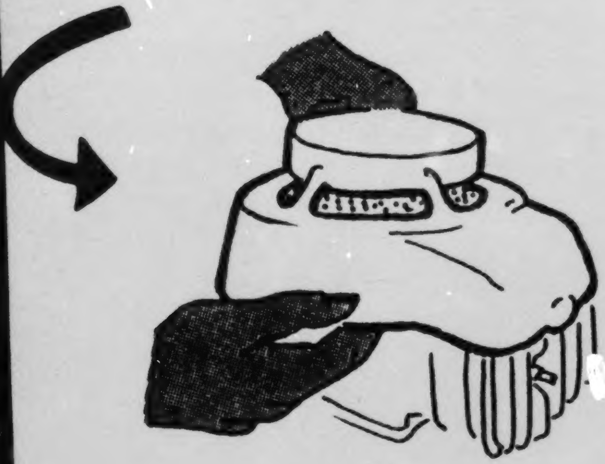
TO SERVICE THE CLUTCH, YOU NEED A SPECIAL BRIGGS & STRATTON TOOL #19114. IT LOOKS LIKE THIS:

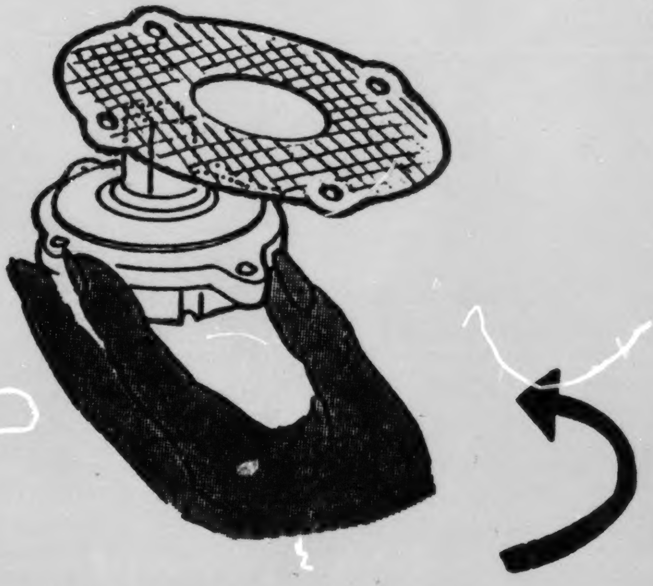


JOB STEPS

1. TAKE YOUR EQUIPMENT TO YOUR WORK AREA.

2. REMOVE THE BLOWER HOUSING, IF THE CLUTCH ASSEMBLY IS MOUNTED ON AN ENGINE.





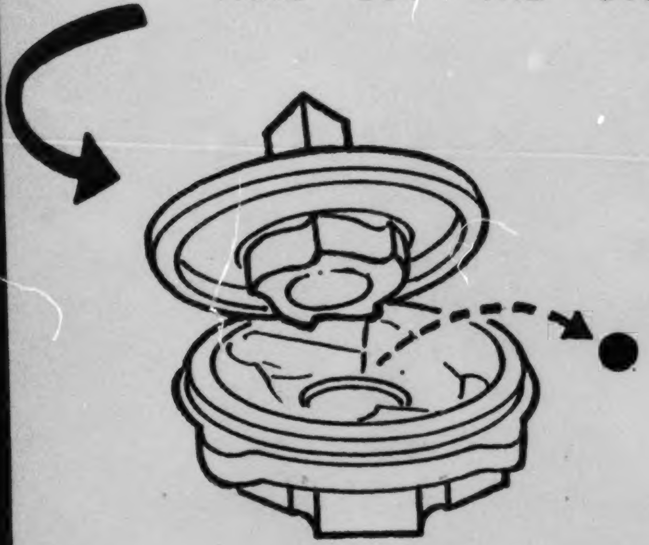
3. TAKE OFF THE ROTATING SCREEN, STARTER RATCHET COVER, AND SEAL. THEY ARE BOLTED TO THE CLUTCH HOUSING.

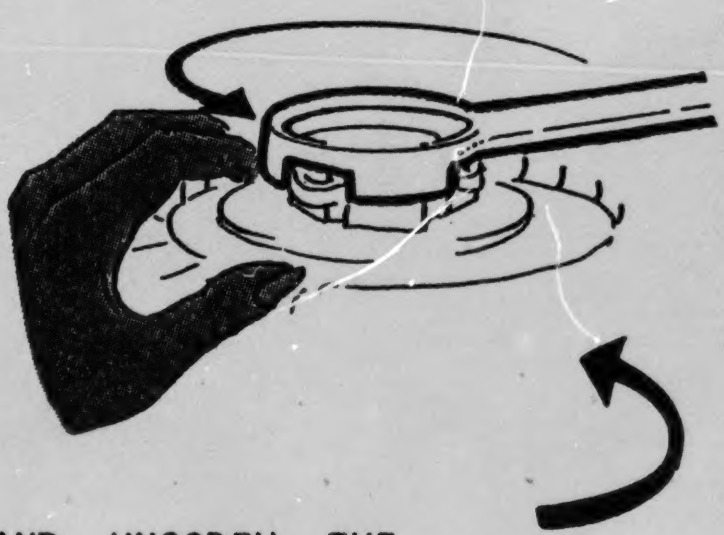
WORD GUIDE

COUNTER-CLOCKWISE - TO THE LEFT.

JOB STEPS

4. LIFT THE RATCHET FROM THE HOUSING AND TAKE OUT THE STEEL BALLS.





5. HOLD THE FLYWHEEL AND UNSCREW THE HOUSING COUNTER-CLOCKWISE. YOU NEED TO USE THE BRIGGS & STRATTON TOOL #19114 TO DO THIS.

WORD GUIDE

CLOCKWISE - TO THE RIGHT.

JOB STEPS

6. INSPECT THE STARTER RATCHET, HOUSING AND STEEL BALLS FOR WEAR. REPLACE THEM, IF THEY ARE WORN OUT.

7. CLEAN THE OLD GREASE OFF ALL PARTS.

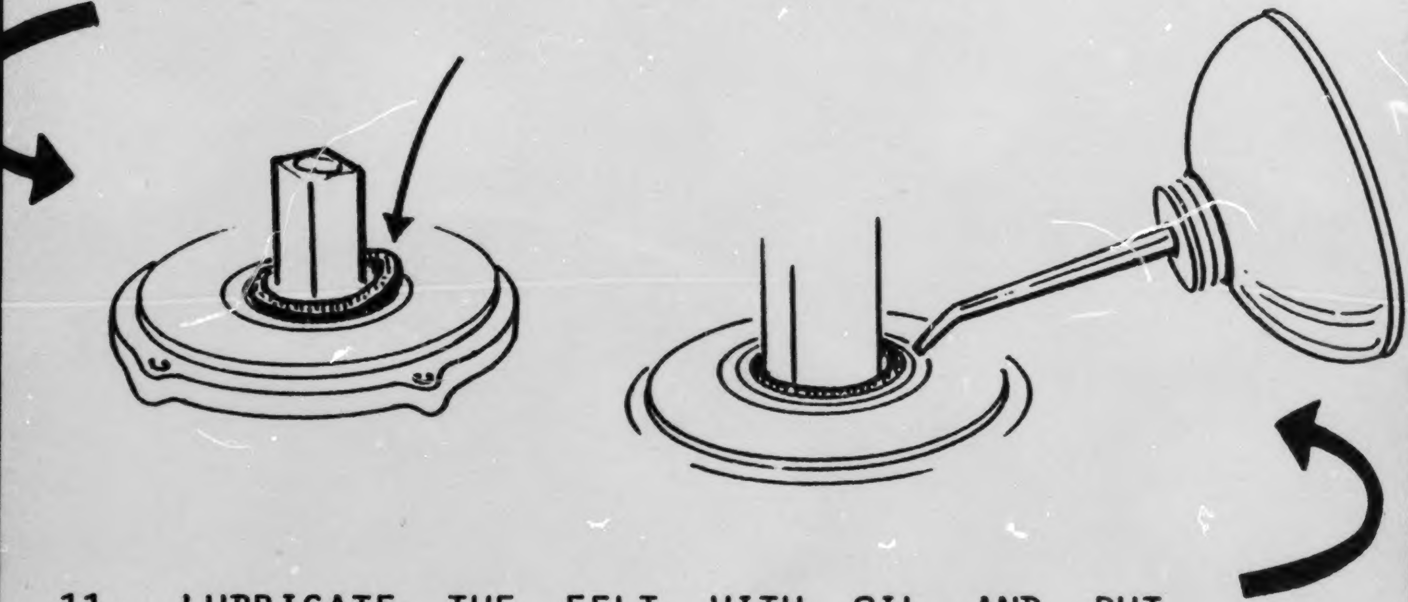
8. PUT THE HOUSING BACK ON THE FLYWHEEL. USE THE BRIGGS & STRATTON TOOL #19114 TO TIGHTEN IT CLOCKWISE.

   NOTE: BE SURE THE SPRING WASHERS ARE PUT BACK IN WITH THE CUP SIDE TOWARD THE FLYWHEEL.

9. CLEAN THE STEEL BALLS AND PUT THEM BACK IN PLACE. DO NOT LUBRICATE THE BALLS.

JOB STEPS

10. CHECK THE FELT SEAL AND PLUG IN THE OUTER END OF THE RATCHET. PUT THE NEW ONES IN IF THEY ARE DAMAGED.



11. LUBRICATE THE FELT WITH OIL AND PUT THE RATCHET ON THE CRANKSHAFT.

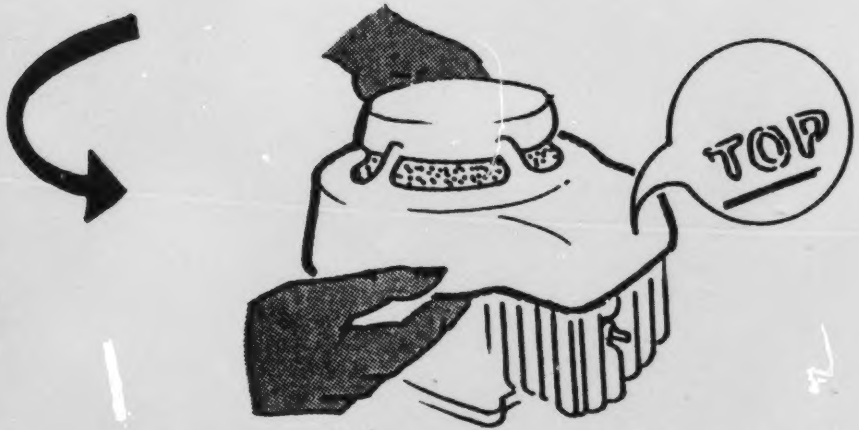
12. PUT A SMALL AMOUNT OF GREASE ON THE RATCHET AND SHAFT.

TURN PAGE →

JOB STEPS

13. PUT THE COVER, ROTATING SCREEN AND RUBBER SEAL ON THE HOUSING. BOLT THEM IN PLACE.

14. PUT THE BLOWER HOUSING BACK ON THE ENGINE. THE WORD "TOP" SHOULD FACE THE ENGINE CYLINDER HEAD.



15. CHECK THE FUEL AND OIL.

16. START THE ENGINE.

17. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: STARTERS

capital area career center

module: 7501 03 004 7 **date:** 7/77 **level:** I

skill title: REPLACE STARTER ROPE

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW REPLACE A STARTER ROPE ON A BRIGGS AND STRATTON ENGINE WITH A RECOIL STARTER.

IN ORDER TO DO THIS YOU WILL NEED:

B & S ENGINE WITH RECOIL STARTER
NEW ROPE
ROPE INSERTER TOOL
B & S SERVICE MANUAL

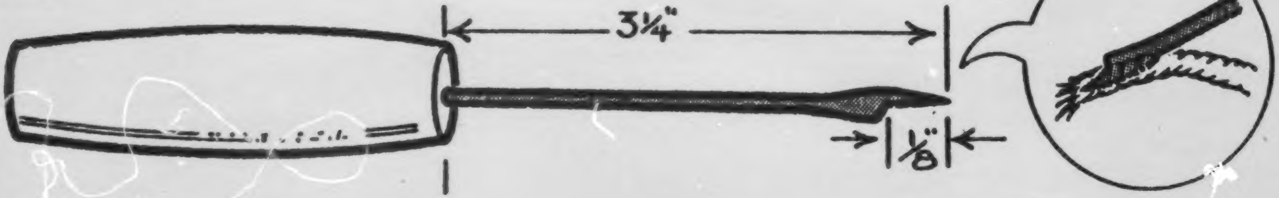
WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE REPLACED THE ROPE TO A RECOIL STARTER SO THAT IT RETURNS TO THE HOUSING WITHOUT HANGING OUT OR COMING LOOSE.

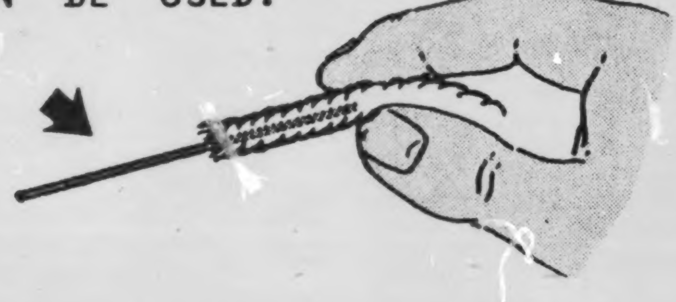
A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

WHEN THE STARTER ROPE GETS FRAYED OR BROKEN, IT MUST BE REPLACED. WHEN YOU GET THE NEW ROPE, BE SURE IT IS THE RIGHT DIAMETER AND LENGTH. A ROPE INSERTER TOOL MAY BE USED TO PUSH THE ROPE THROUGH THE PULLEY.



A WIRE ALSO CAN BE USED:

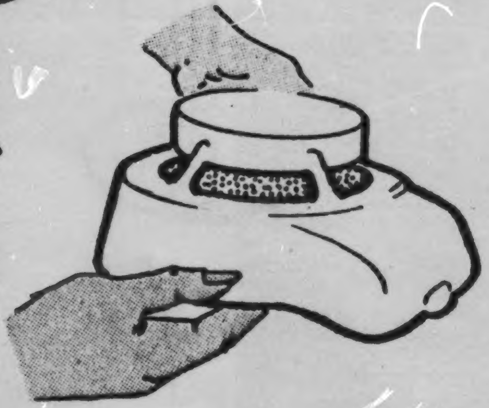


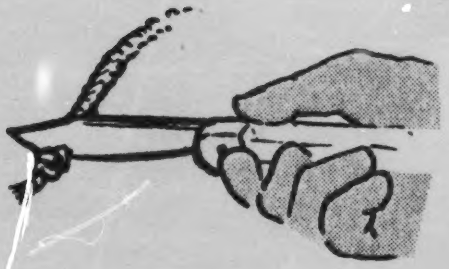
THE STARTER PULLEY AND SPRING SHOULD NOT HAVE TO BE REMOVED FROM THE HOUSING TO CHANGE THE ROPE.

JOB STEPS

1. TAKE ALL EQUIPMENT TO YOUR WORK AREA.

2. REMOVE THE BLOWER HOUSING FROM THE ENGINE.





3. CUT OFF THE KNOT FROM THE PULLEY AND TAKE THE OLD ROPE OUT OF THE PULLEY.

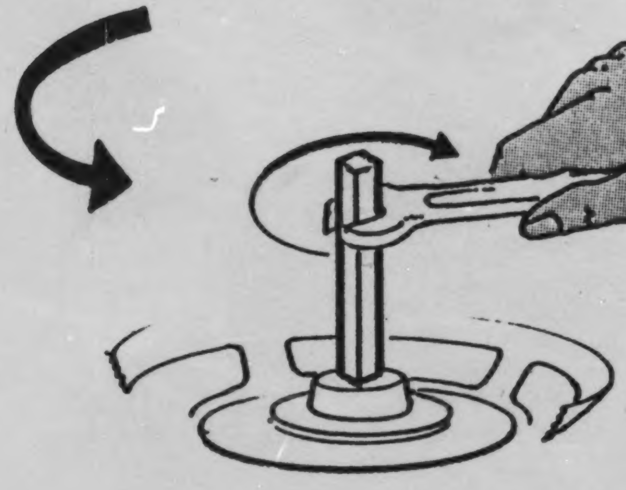
4. TIE THE NEW ROPE IN THE HANDLE.

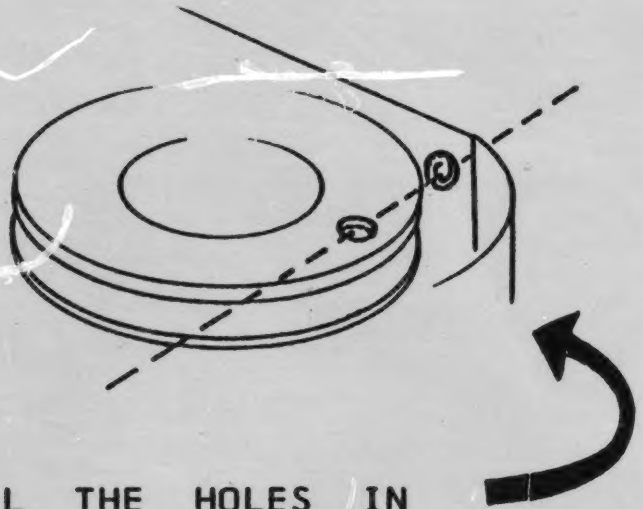
WORD GUIDE

COUNTER CLOCKWISE - TO THE LEFT

JOB STEPS

5. PUT A 3/4" PIECE OF METAL IN THE PULLEY KNOB AND TURN THE HUB COUNTER CLOCKWISE UNTIL THE SPRING IS TIGHT.





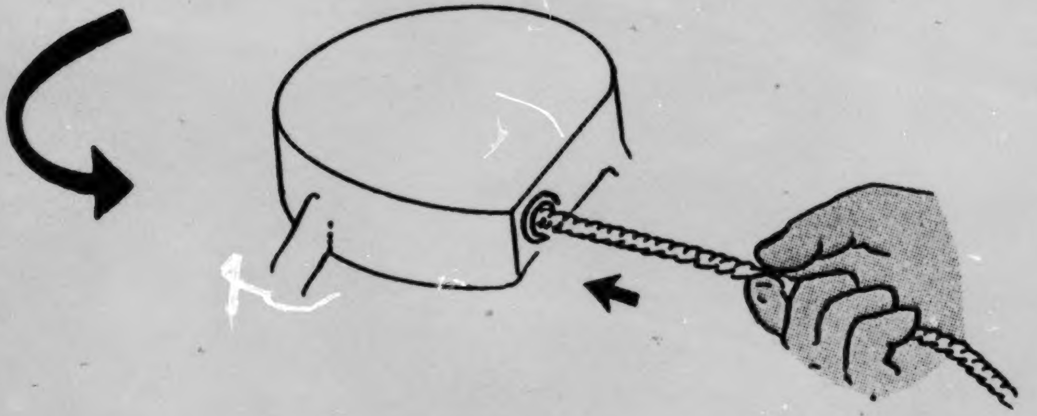
6. BACK OFF THE PULLEY UNTIL THE HOLES IN THE HOUSING AND PULLEY ARE LINED UP.

7. USING THE WIRE OR ROPE INSERTER TOOL, FEED THE NEW ROPE INTO THE PULLEY. SEE PICTURE IN JOB STEP #6.

JOB STEPS

8. TIE A KNOT IN THE ROPE.

9. RELEASE THE PULLEY, LETTING THE SPRING WIND THE ROPE INTO THE PULLEY.



10. PUT THE BLOWER HOUSING BACK ONTO THE ENGINE.

11. CHECK THE FUEL AND OIL.

12. START THE ENGINE.

13. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: FUEL TANKS AND FUEL FILTERS

capital area career center

module: 7501 04 001 7 **date:** 4/77 **level:**

skill title: REMOVAL, CLEANING AND REPLACEMENT OF FUEL TANKS AND FUEL FILTERS

developed & written by: ANITA FLAGG

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE, CLEAN AND REPLACE FUEL TANKS AND FUEL FILTERS.

AND IN ORDER TO DO THIS YOU WILL NEED:

A 2 OR 4 CYCLE ENGINE

A SCREWDRIVER SET

A SOCKET SET

AN OPEN-END WRENCH SET

A FLASHLIGHT

SAFETY GLASSES

WORD GUIDE

GUNK - FILTHY, STICKY OR GREASY MATTER.

WE WILL KNOW YOU CAN DO THIS WHEN:

YOU HAVE REMOVED BOTH THE TANK AND FILTER, CLEANED THE DIRT, WATER, RUST, GUM AND GUMK AND HAVE REPLACED THEM SECURELY IN THEIR PROPER POSITIONS.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

WORD GUIDE

IGNITED - SET ON FIRE.

JOB STEPS

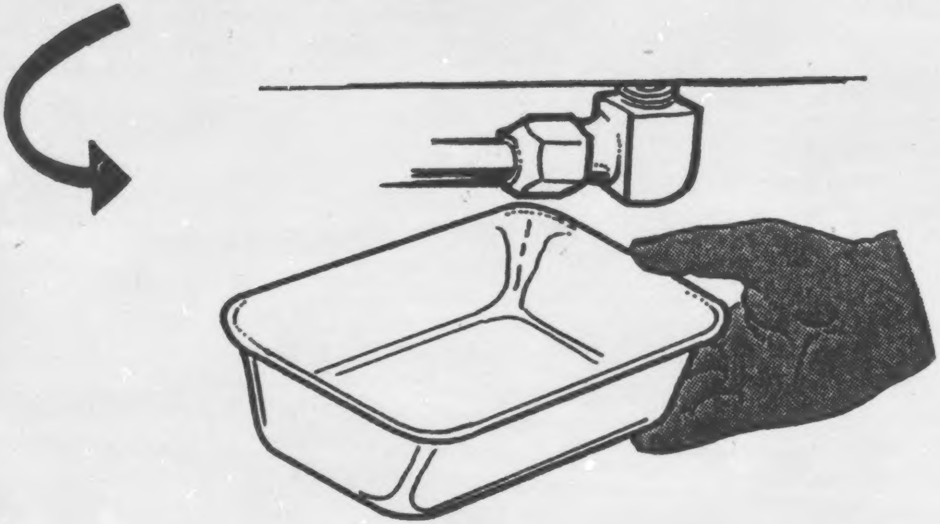
1. USING OPEN-END WRENCH SET, LOOSEN THE DRAIN PLUG OR DISCONNECT THE FUEL LINE AND THEN DRAIN ANY FUEL IN THE TANK INTO A CLOSEABLE CONTAINER.

> CAUTION: DO NOT LEAVE FUEL IN AN OPEN CONTAINER WHERE IT COULD BE IGNITED ACCIDENTALLY.

2. USING OPEN-END WRENCH SET, DISCONNECT THE FUEL LINE BY CAREFULLY LOOSENING THE CONNECTOR.

JOB STEPS

3. PLACE A DRAIN PAN BENEATH THE CONNECTOR TO CATCH FUEL THAT MAY DRAIN OUT.



4. USING SCREWDRIVER AND SOCKET SET, LOOSEN THE SCREWS AND BOLTS ON THE FUEL TANK. THEN, CAREFULLY REMOVE THE FUEL TANK FROM IT'S MOUNTING.

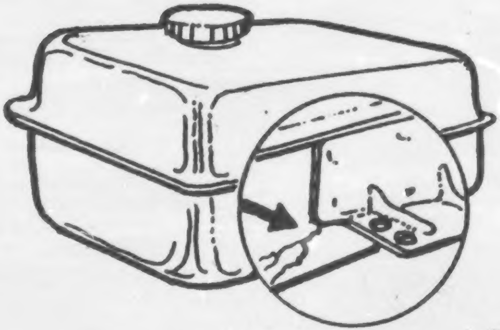
JOB STEPS

5. CHECK THE TANK FOR RUST SPOTS, OR CRACKS.

   A. LOOK CLOSELY AT THE SEAMS WHERE THE METAL PIECES JOIN TOGETHER.

   B. LOOK CLOSELY AROUND THE POINTS WHERE THE TANK IS MOUNTED TO IT'S STAND OR ENGINE.

NOTE: STRESS-CRACKS OFTEN DEVELOP AROUND THESE MOUNTING POINTS BECAUSE OF ENGINE VIBRATION.

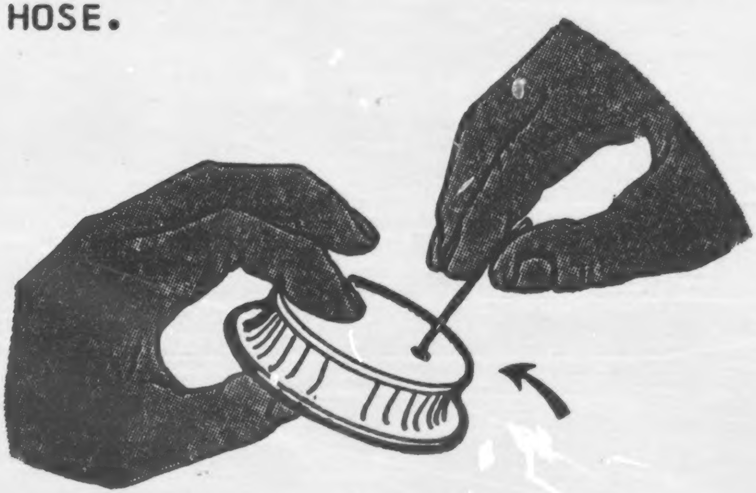


WORD GUIDE

VENT - SMALL HOLE

JOB STEPS

6. UNSCREW THE FUEL TANK CAP. LOOK CLOSELY AT THE SMALL HOLE IN THE TOP. IF THIS VENT IS CLOGGED WITH DIRT, CLEAN IT WITH A SMALL PIN OR A LIGHT BLAST OF AIR FROM THE AIR HOSE.



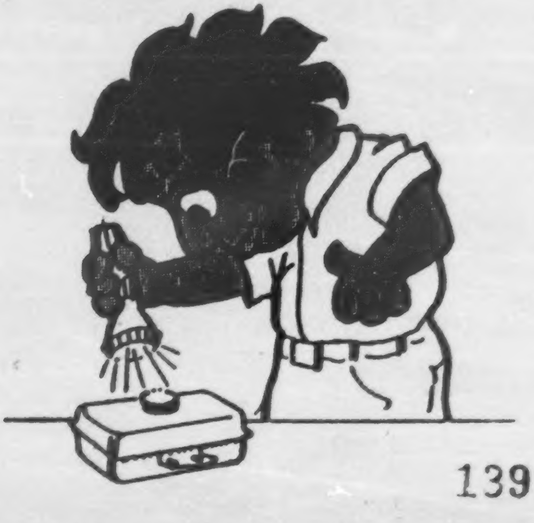
WORD GUIDE

GUM - STICKY SUBSTANCE.

SOLVENT - TYPE OF CLEANING FLUID.

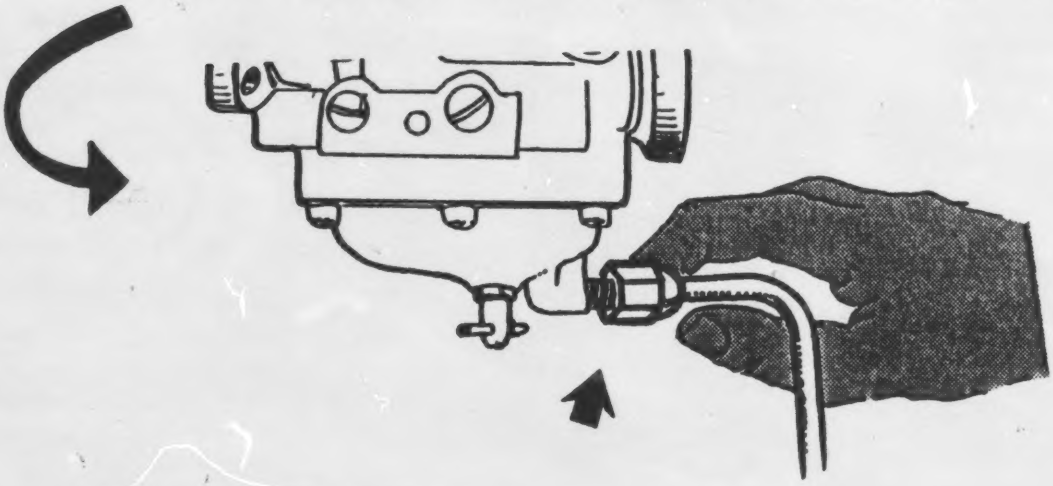
JOB STEPS

7. USING FLASHLIGHT, LOOK INTO THE FUEL TANK. THE INSIDE SHOULD BE SHINY. IF THERE IS BROWN GUM OR DIRT ANYWHERE CLEAN IT BY RINSING THE TANK WITH CLEAN GASOLINE OR A CLEANING SOLVENT. THEN, BLOW IT DRY WITH COMPRESSED AIR.



JOB STEPS

8. USING SOCKET WRENCH REMOVE THE FUEL PIPES FROM THE CARBURETOR BODY.



9. CLEAN THE FILTERS BY SOAKING THEM IN CLEAN GASOLINE OR A CLEANING SOLVENT. THEN, BLOW DRY WITH COMPRESSED AIR.

CAUTION: DO NOT SOAK NYLON FUEL PIPES IN SOLVENT FOR MORE THAN 25 MINUTES.

WORD GUIDE

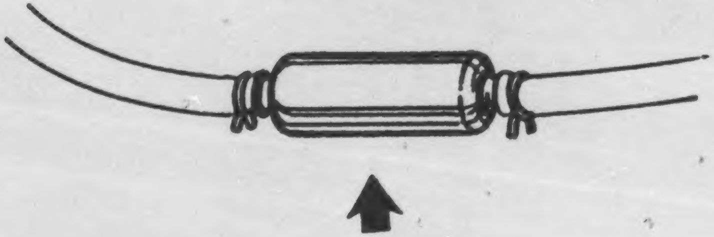
NYLON - WHITE PLASTIC MATERIAL.

JOB STEPS

10. AFTER YOU HAVE CLEANED AND DRIED THE FILTERS, USE THE SOCKET SET TO CAREFULLY SCREW FILTERS INTO THE CARBURETOR BODY.

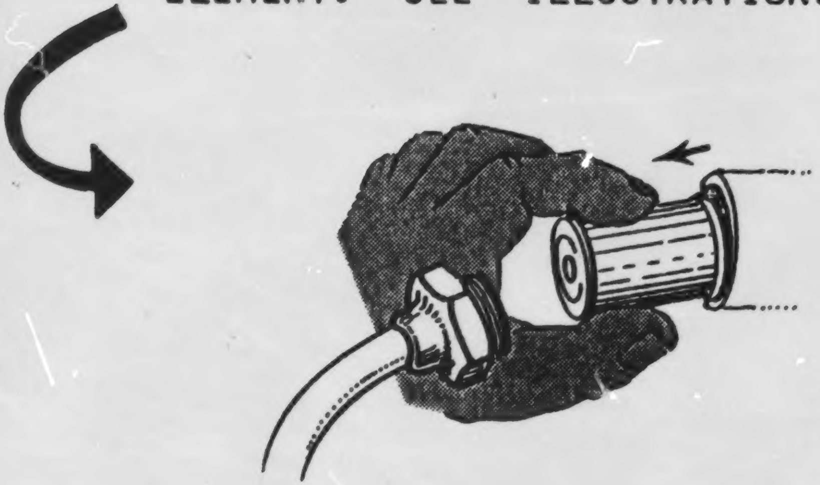
CAUTION: DO NOT OVER-TIGHTEN THEM.

NOTE: SOME FUEL FILTERS ARE PART OF THE GAS LINE. THEY ARE CALLED IN-LINE FUEL FILTERS.



JOB STEPS

11. UNSCREW THE FILTER HEAD FROM THE FILTER BODY AND REMOVE THE FILTER ELEMENT. SEE ILLUSTRATION.



12. SOAK THE FILTER ELEMENT IN A CLEANING SOLVENT FOR 30 MINUTES.

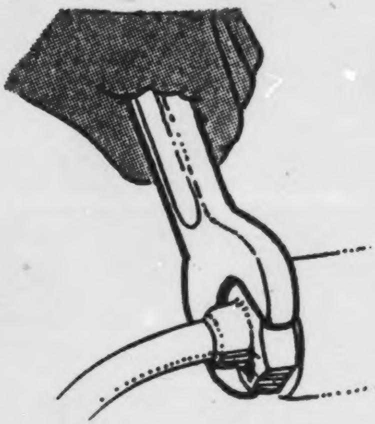
13. RINSE ELEMENT IN CLEAN GASOLINE AND THEN BLOW DRY WITH COMPRESSED AIR.

JOB STEPS

14. USING OPEN-END WRENCH SET, CAREFULLY PUT THE FILTER ASSEMBLY BACK TOGETHER BY:

    A. PLACING THE FILTER ELEMENT INTO THE FILTER BODY.

    B. SCREWING THE FILTER HEAD ONTO THE FILTER BODY. →



NOTE: IF THE IN-LINE FILTER IS MADE OF NYLON, OR SOME OTHER PLASTIC MATERIAL. YOU USUALLY REPLACE IT WITH A NEW PART, BECAUSE IT CANNOT BE DISASSEMBLED AND CLEANED.

TURN PAGE →

JOB STEPS

15. USING OPEN-END WRENCH SET, SOCKET SET AND SCREWDRIVER, REPLACE THE FUEL TANK ON IT'S MOUNTINGS, AND IF THE TANK IS NOT FASTENED DIRECTLY TO CARBURETOR, CONNECT THE FUEL TANK.

16. FILL THE TANK WITH FUEL.

17. LOOK CLOSELY ALONG THE SEAMS AND AROUND THE MOUNTING POINTS FOR LEAKS. ALSO, IF THE TANK HAS AN EXTERIOR FUEL LINE, CHECK THE FUEL LINE CONNECTIONS.

18. START THE ENGINE TO SEE IF THE CORRECT AMOUNT OF FUEL IS REACHING THE CARBURETOR.

small engine repair

unit: CARBURETORS

capital area career center

module: 7501 05 003 date: level:

skill title: CARBURETOR OVERHAUL (SLIDING VALVE TYPE)

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO OVERHAUL A SLIDING VALVE TYPE CARBURETOR USED ON TWO CYCLE ENGINES.

IN ORDER TO DO THIS YOU WILL NEED:

A SLIDING VALVE TYPE CARBURETOR

HAND TOOLS

SERVICE MANUAL FOR THE BRAND CARBURETOR YOU ARE GOING TO OVERHAUL

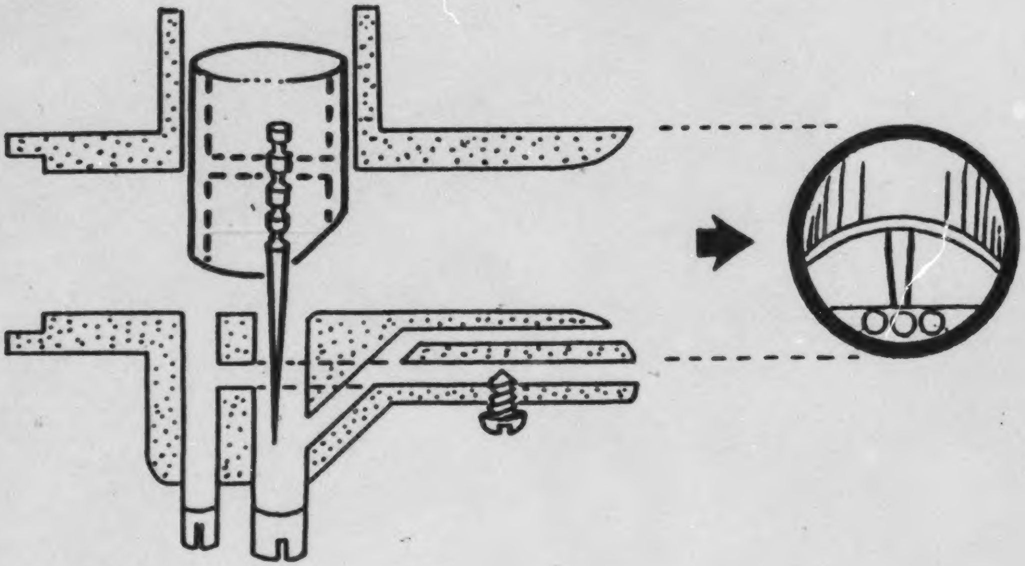
WE WILL KNOW YOU CAN DO IT WHEN:

THE CARBURETOR IS OVERHAULED ACCORDING TO THE SERVICE SPECIFICATIONS, WORKS PROPERLY ON THE ENGINE, AND THERE ARE NO FUEL LEAKS.

A TAPE OF THIS MODULE IS AVAILABLE

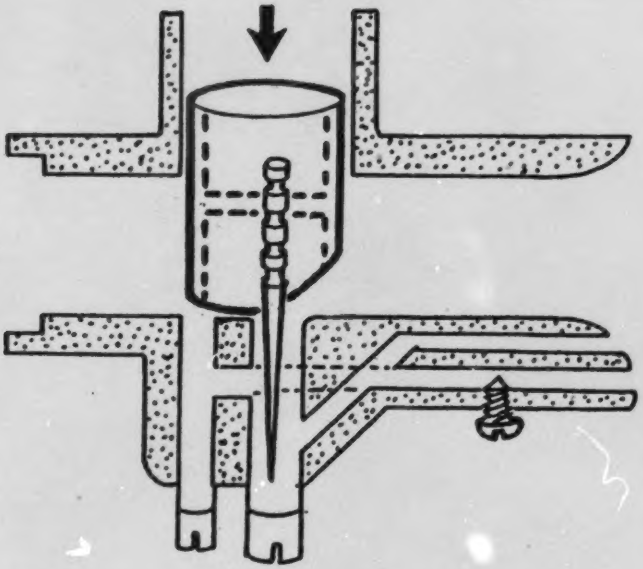
INFORMATION

IN THIS MODULE YOU ARE GOING TO LEARN ABOUT SLIDING VALVE TYPE CARBURETORS. A SLIDING VALVE CARBURETOR IS ALSO CALLED A VARIABLE VENTURI CARBURETOR. THE VENTURI IS THE NARROW PART IN THE THROAT OF THE CARBURETOR.



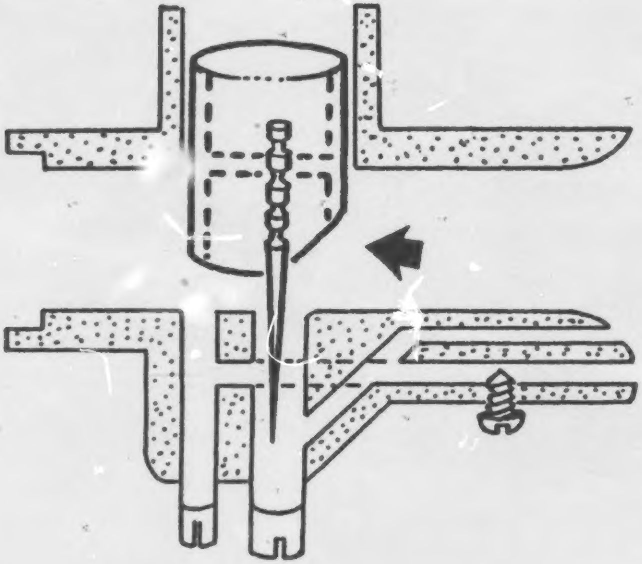
INFORMATION

IN THE SLIDING VALVE CARBURETOR THE THROTTLE SLIDE MOVES BACK AND FORTH. IT CONTROLS ENGINE SPEED BY OPENING AND CLOSING THE SIZE OF THE VENTURI. AT IDLE SPEED THE THROTTLE SLIDE IS SHUT. IT SHUTS OFF THE VENTURI.



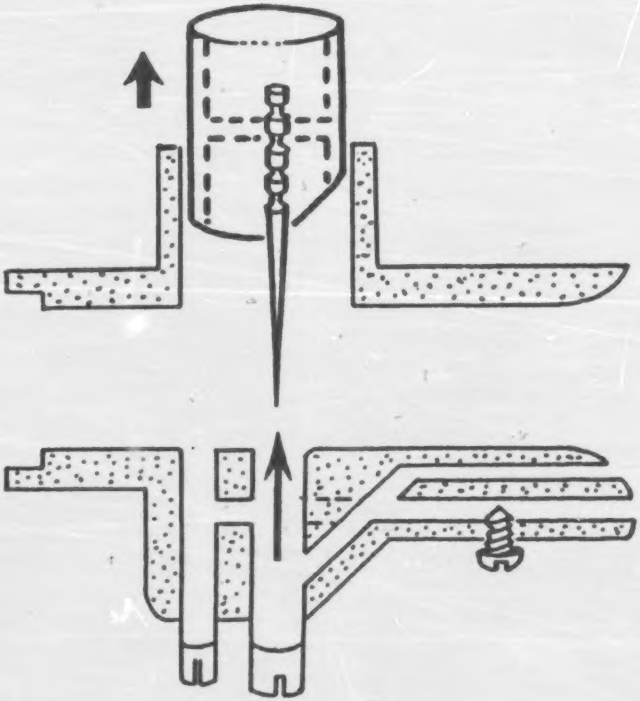
INFORMATION

THE IDLE MIXTURE ADJUSTMENT SCREW CONTROLS IDLE SPEED. WHEN THE THROTTLE IS ABOUT 1/4 OPEN, THE AMOUNT OF FUEL MIXTURE IS CONTROLLED BY THE SHAPE OF THE SLIDE.



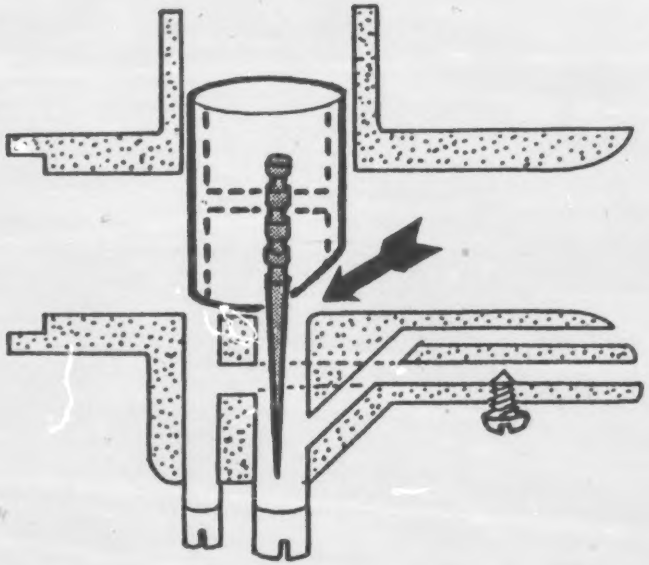
INFORMATION

WHEN THE SLIDE IS OPENED MORE, THE ENGINE RUNS FASTER. FOR FULL SPEED, THE SLIDE IS ALL THE WAY UP. THE GAS IS SUCKED UP THE VALVE NEEDLE INTO THE VENTURI.



INFORMATION

FOR INTERMEDIATE SPEEDS, THE VALVE NEEDLE ADJUSTS THE AMOUNT OF FUEL GOING INTO THE VENTURI.



THIS MODULE SHOWS HOW TO OVERHAUL A CARBURETOR ON A NORTON ATLAS.

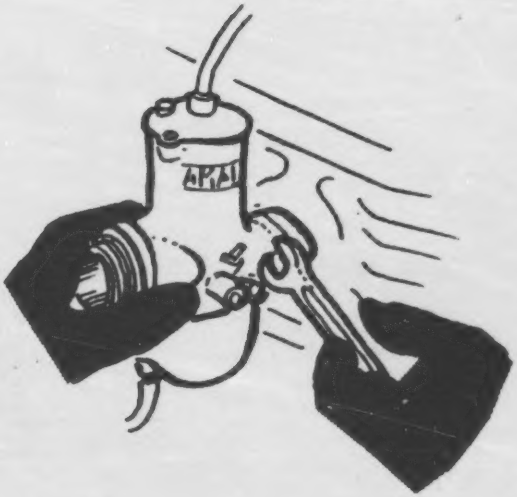
IF YOU HAVE A DIFFERENT CARBURETOR, READ ITS' SERVICE MANUAL.

WORD GUIDE

FUEL TAP - A VALVE THAT IS USED TO CONTROL THE FLOW OF FUEL FROM THE TANK.

JOB STEPS

1. CLOSE FUEL TAP AND REMOVE AIR CLEANERS.
2. REMOVE THE CARBURETOR FROM THE ENGINE.

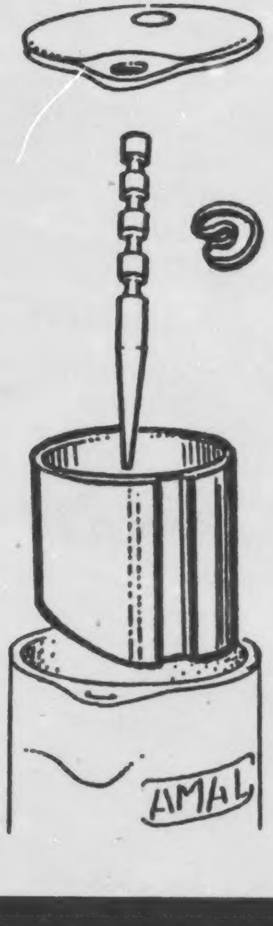


WORD GUIDE

JET - A SMALL HOLE OR NEEDLE THAT FUNNELS THE FUEL INTO A STREAMER OR SPRAY.

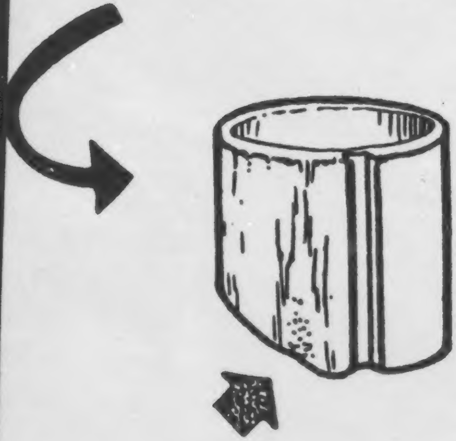
JOB STEPS

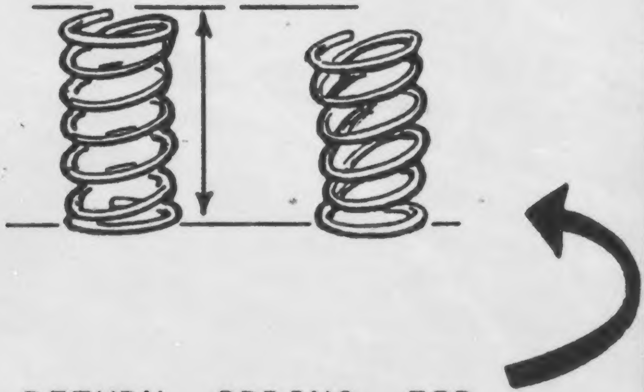
3. REMOVE MIXING CHAMBER CAP HOLDER AND PULL FROM CARBURETOR TOGETHER WITH THROTTLE VALVE, JET NEEDLES, AND JET NEEDLE CLIPS. (SEE DIAGRAM) →



JOB STEPS

4. INSPECT THE THROTTLE VALVE SLIDE FOR EXCESSIVE SCORING AT THE FRONT AREA AND CHECK THE EXTENT OF WEAR ON THE REAR SLIDE FACE. IF WEAR IS APPARENT, THE SLIDE SHOULD BE RENEWED.

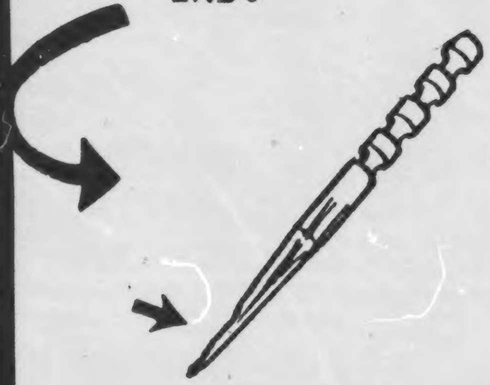


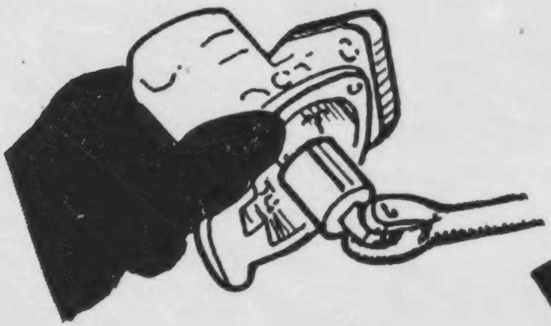


5. INSPECT THE THROTTLE RETURN SPRING FOR LOSS OF "SPRINGINESS". REPLACE IF IN DOUBT.

JOB STEPS

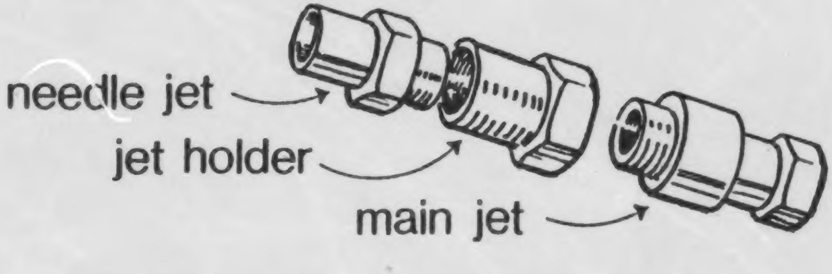
6. CHECK THE NEEDLE JET FOR WEAR OR POSSIBLE SCRATCHES, ESPECIALLY THE TAPERED END.





7. NEXT, REMOVE THE MAIN JET HOLDER.

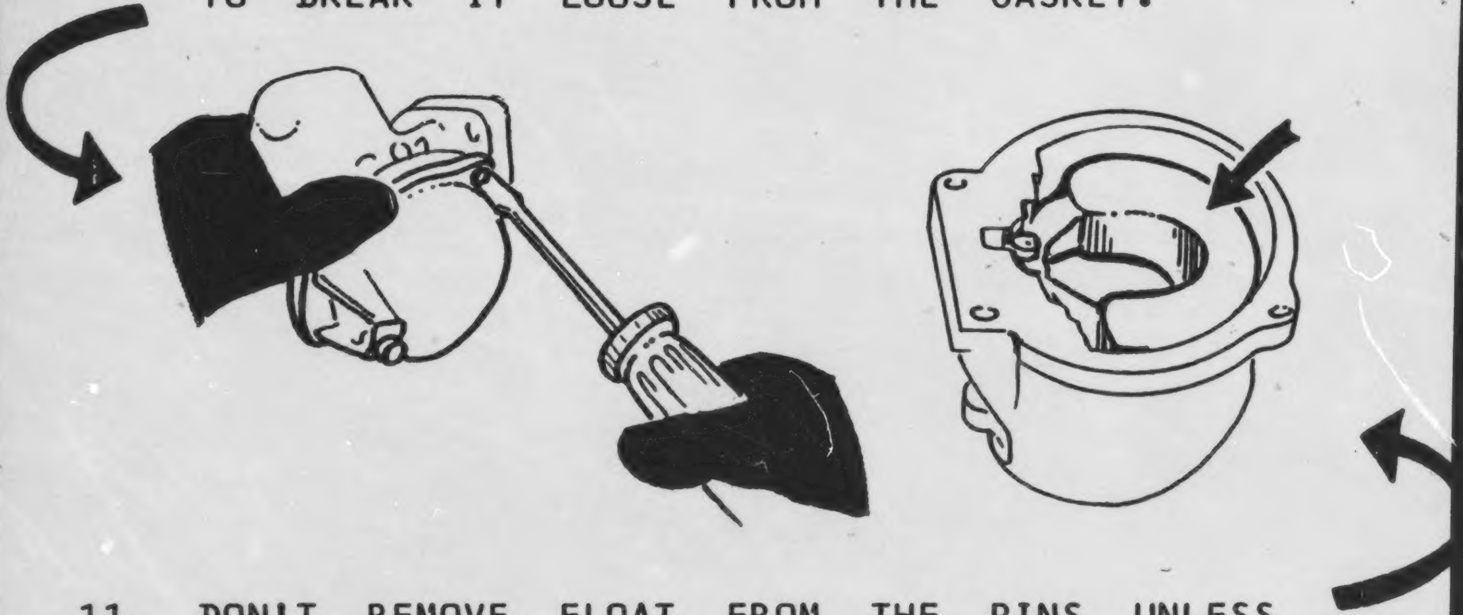
8. AND THEN REMOVE THE MAIN JET FROM ITS HOLDER.


needle jet
jet holder
main jet

JOB STEPS

9. CLEAN THE JETS BY BLOWING WITH COMPRESSED AIR. NEVER USE WIRE OR ANY OTHER TYPE OF TOOL TO CLEAR PASSAGEWAY.

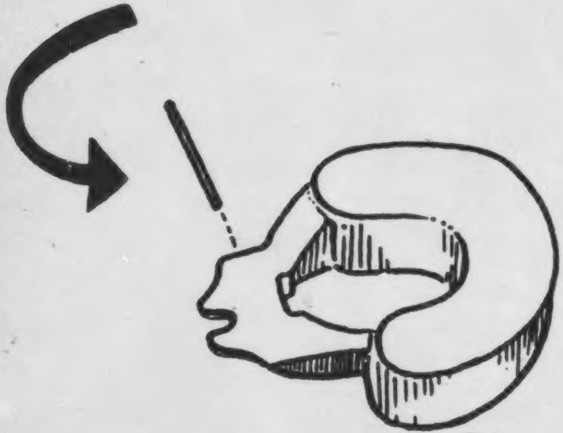
10. REMOVE BOWL COVER SCREWS. TAP THE BOWL TO BREAK IT LOOSE FROM THE GASKET.

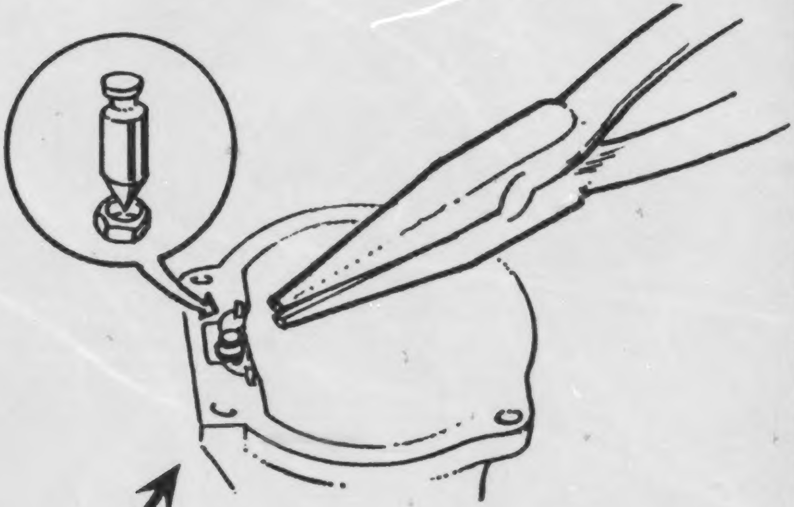


11. DON'T REMOVE FLOAT FROM THE PINS UNLESS THE FLOATS ARE LEAKING. IT IS THEN ADVISABLE TO BUY REPLACEMENT FLOATS INSTEAD OF REPAIRING THEM.

JOB STEPS

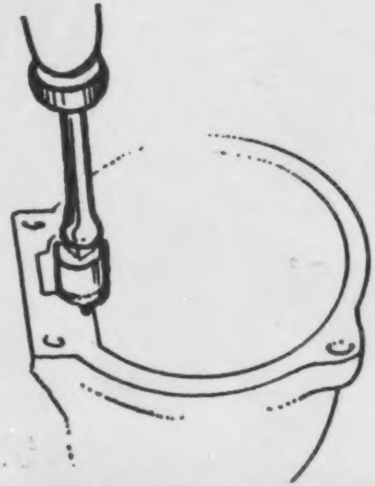
12. WITHDRAW FLOAT LEVER PIN AND FLOAT LEVER.





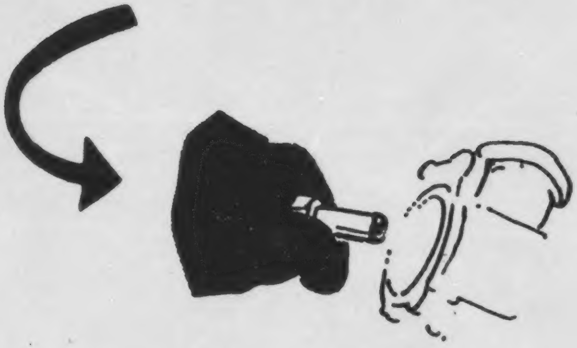
13. REMOVE FLOAT NEEDLE.

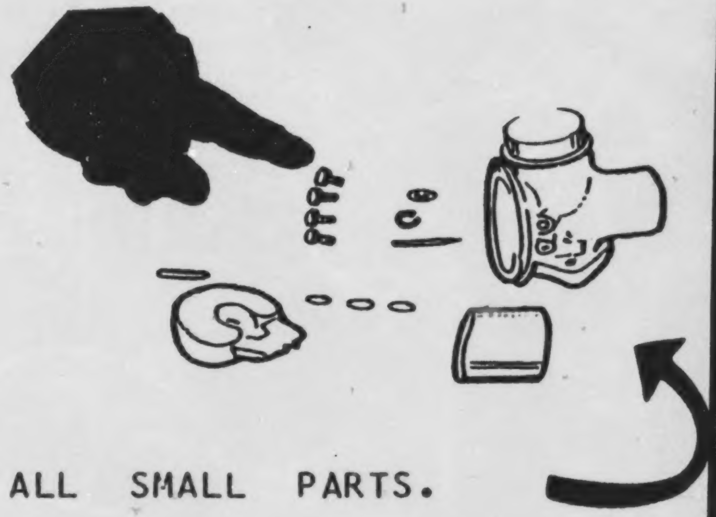
14. REMOVE FLOAT NEEDLE SEAT WITH SMALL METRIC WRENCH.



JOB STEPS

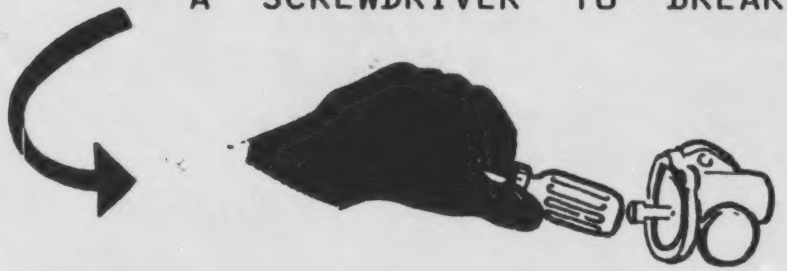
15. NEXT, REMOVE JET NEEDLE HOLDER.





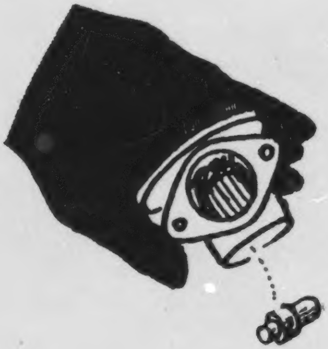
16. KEEP TRACK OF ALL SMALL PARTS.

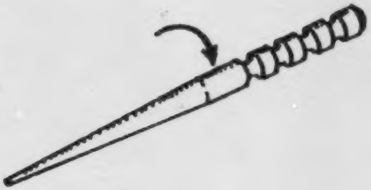
17. TO REMOVE THE NEEDLE JET, SCREW HOLDER BACK IN WITHOUT THE WASHER. TAP IT WITH A SCREWDRIVER TO BREAK IT LOOSE.



JOB STEPS

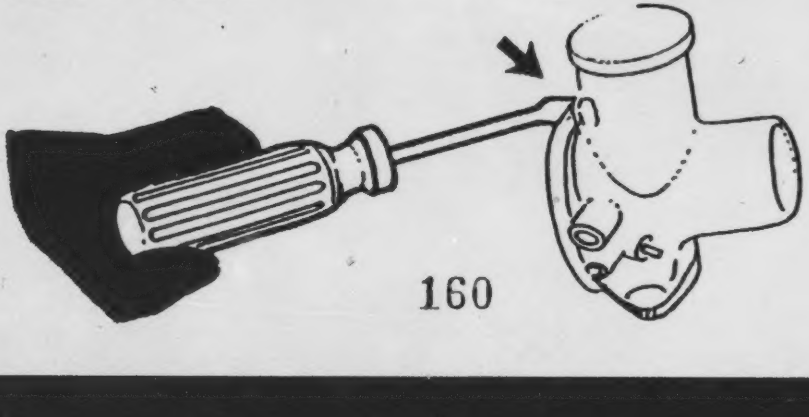
18. INVERT THE CARBURETOR AND GENTLY TAP THE NEEDLE JET OUT.





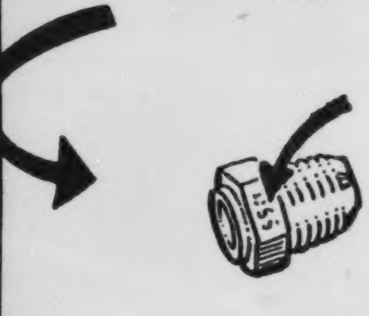
19. IF YOU WANT TO KNOW THE SIZE OF THE NEEDLE JET, IT IS STAMPED ON THE SIDE.

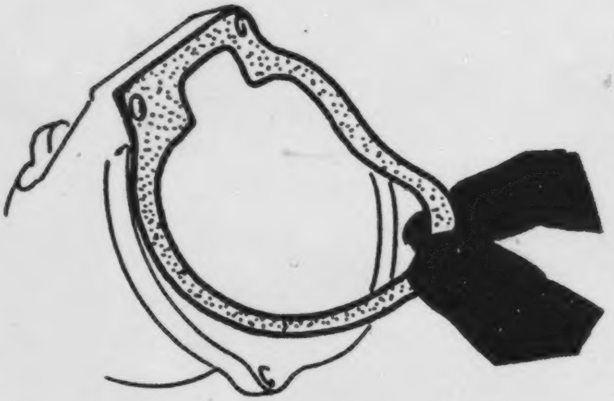
20. USING A SMALL SCREWDRIVER, UNSCREW THE PILOT JET.



JOB STEPS

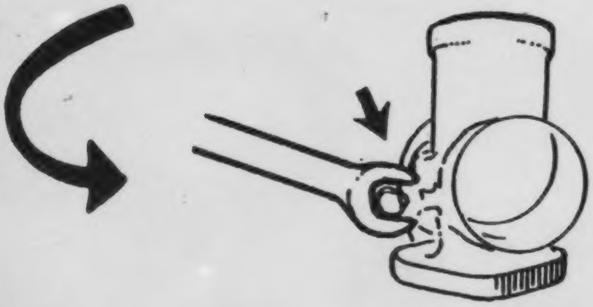
21. AGAIN, JET SIZE IS STAMPED ON THE SIDE OF THE BARREL.





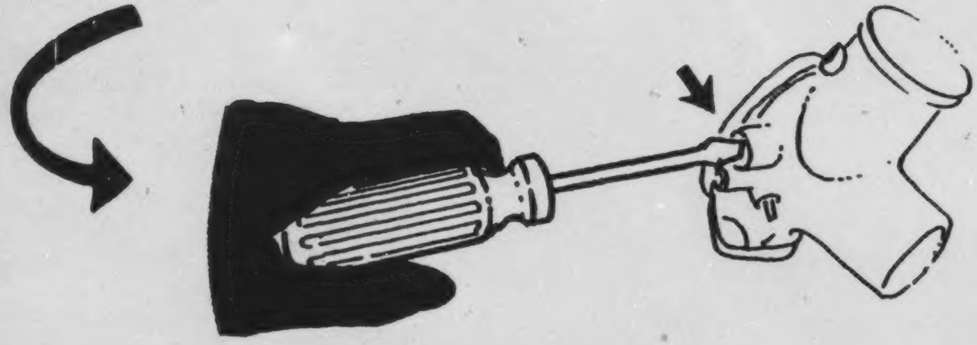
22. IF CARBURETOR IS TO BE DIPPED IN A CLEANER, REMOVE THE FLOAT BOWL GASKET. IT IS A GOOD IDEA TO REPLACE THIS GASKET IF POSSIBLE.

23. REMOVE STARTER ASSEMBLY.

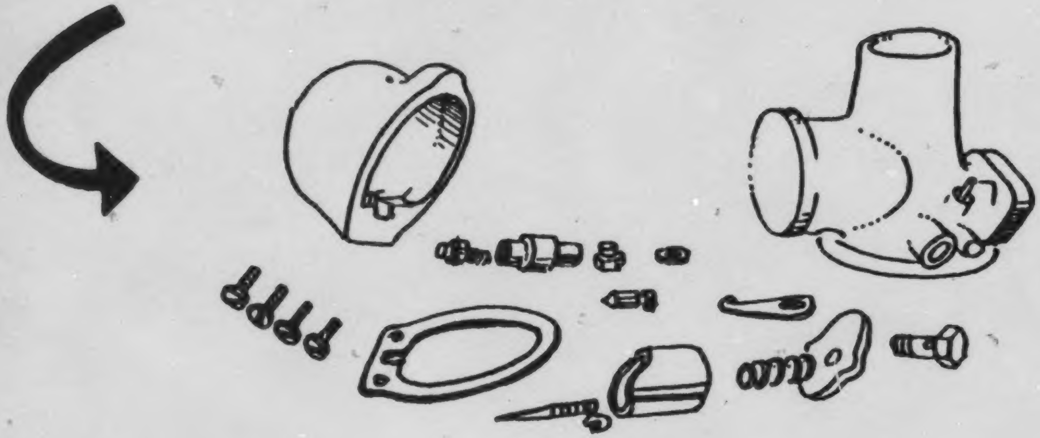


JOB STEPS

24. REMOVE IDLE AIR SCREW.



25. WHEN DIS-ASSEMBLY IS COMPLETE, IT SHOULD LOOK LIKE THIS:



JOB STEPS

26. GET THE REPLACEMENT GASKETS AND OTHER PARTS YOU WILL NEED.

27. PUT THE CARBURETOR BACK TOGETHER.

28. WHEN PUTTING THE VALVE NEEDLE IN, BE SURE TO CHECK THE MANUFACTURER'S SPECIFIED SETTING.

29. PUT THE CARBURETOR BACK ON THE ENGINE. START THE ENGINE AND LET IT WARM UP.

30. MAKE A FINAL SLOW IDLE ADJUSTMENT ACCORDING TO MANUFACTURERS SPECIFICATIONS.

31. HAVE THE INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: CARBURETOR

capital area career center

module: 7501 05 004 7 date: 5/77 level: I

skill title: CARBURETOR OVERHAUL - SUCTION TYPE

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

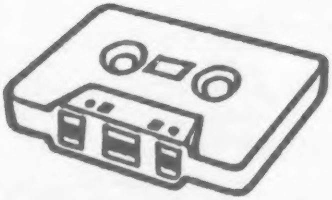
HOW TO OVERHAUL A SUCTION TYPE CARBURETOR USED ON A TWO CYCLE ENGINE.

IN ORDER TO DO THIS YOU WILL NEED:

SUCTION CARBURETOR
HAND TOOLS
SERVICE MANUAL FOR THE KIND OF CARBURETOR ON WHICH YOU ARE WORKING.

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE OVERHAULED THE CARBURETOR ACCORDING TO SERVICE SPECIFICATIONS AND IT WORKS PROPERLY ON THE ENGINE.



A TAPE OF THIS MODULE IS AVAILABLE.

WORD GUIDE

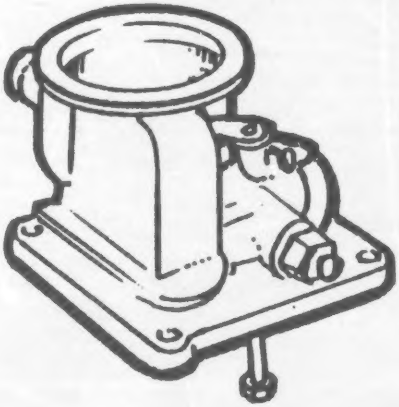
VENTURI - A SHORT TUBE THROUGH WHICH FUEL FLOWS.

INFORMATION

THE SUCTION CARBURETOR IS THE SIMPLEST CARBURETOR. THERE IS ONLY ONE FUEL MIXTURE ADJUSTMENT. AIR IS DRAWN INTO THE AIR HORN. THE VACUUM FROM THE ENGINE DRAWS THE AIR FUEL MIXTURE THROUGH THE VENTURI INTO THE ENGINE.

THE SPEED OF THE ENGINE IS CONTROLLED BY THE POSITION OF THE THROTTLE PLATE. THIS REGULATES THE AMOUNT OF AIR-FUEL MIXTURE ENTERING THE ENGINE.

THE CARBURETOR WE ARE GOING TO OVERHAUL IS FOR A BRIGGS AND STRATTON ENGINE.

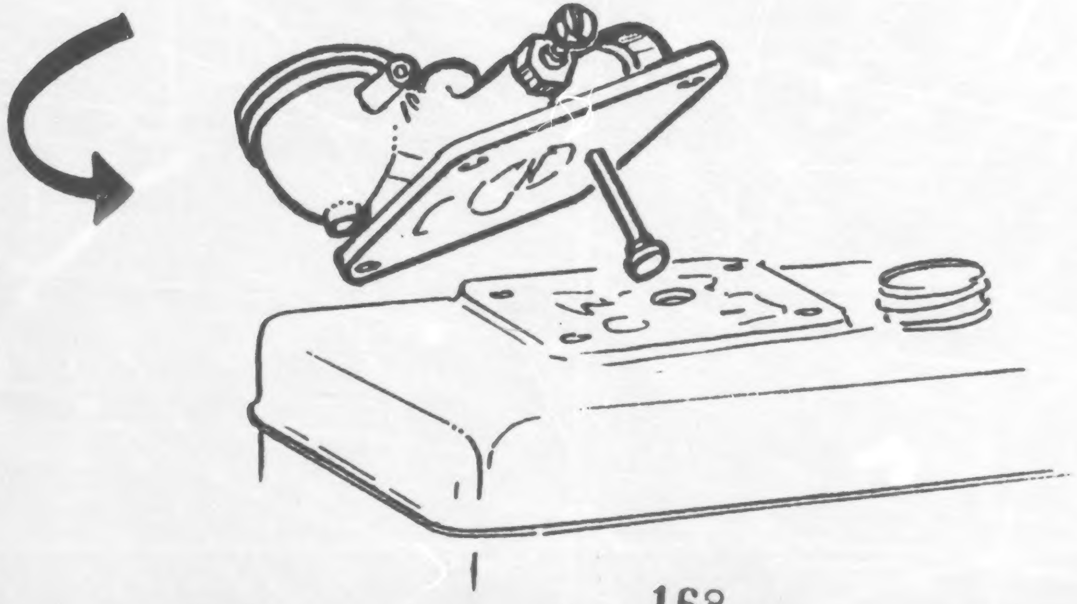


JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

2. CHECK THE SERVICE MANUAL FOR ANY SPECIAL INFORMATION ABOUT YOUR CARBURETOR. (SPECIAL TOOLS NEEDED OR PARTS THAT SHOULD NOT BE REMOVED).

3. REMOVE THE CARBURETOR FROM THE ENGINE. BE SURE YOU REMOVE ALL RUBBER AND PLASTIC PARTS.

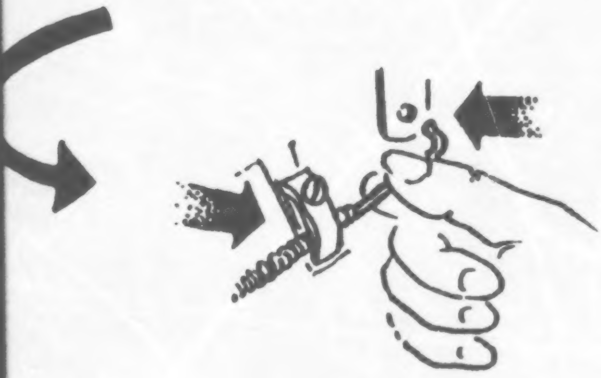


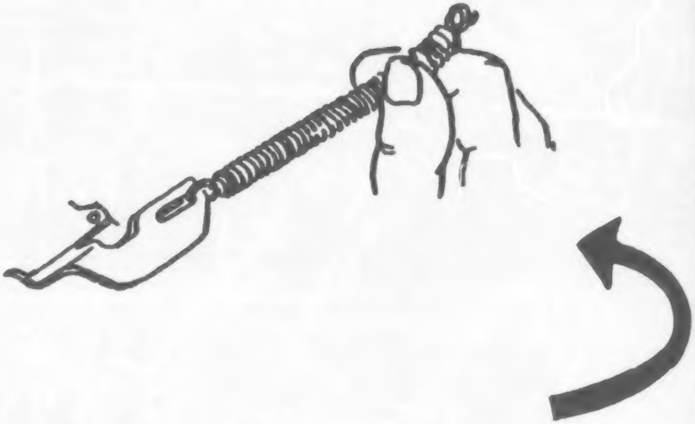
JOB STEPS

4. WHEN YOU COME TO THE FLOAT, REMOVE IT AND HOLD IT UP TO YOUR EAR. SHAKE IT TO SEE IF THERE IS ANY GAS INSIDE THE FLOAT.

5. IF THERE IS GAS INSIDE, YOU WILL HAVE TO REPLACE THE FLOAT.

6. REMOVE THE THROTTLE CONTROL LINK AND CHOKE LINKAGE.

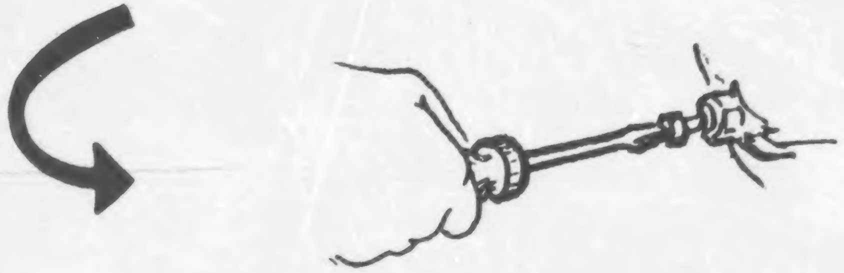




7. REMOVE THE GOVERNOR LINKAGE AND SPRING.

JOB STEPS

8. REMOVE THE NEEDLE VALVE.



9. CHECK THE THROTTLE PLATE AND BUSHINGS. IF THEY ARE WORN, REPLACE THEM.

10. PUT ALL METAL PARTS INTO CARBURETOR CLEANER. LET PARTS SOAK ABOUT 20 MINUTES.

WARNING: THIS CARBURETOR CLEANER CAN BURN YOUR SKIN SO BE CAREFUL NOT TO GET ANY ON YOUR SKIN OR IN YOUR EYES.

WORD GUIDE

OLEUM - HEAVY, OILY SOLUTION USED TO RINSE METAL PARTS.

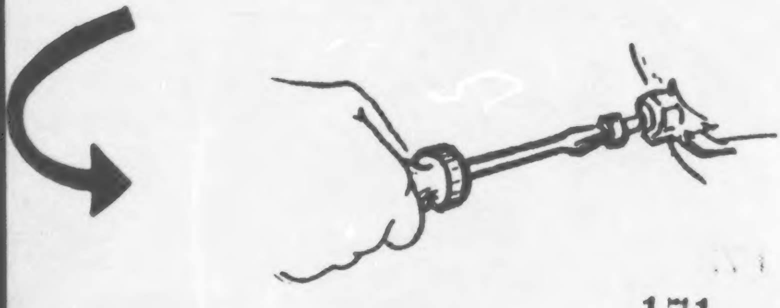
JOB STEPS

11. REMOVE PARTS FROM CARBURETOR CLEANER AND PUT THEM IN OLEUM TO RINSE.

12. AFTER RINSING PARTS, BLOW OUT PASSAGES WITH DRY COMPRESSED AIR.

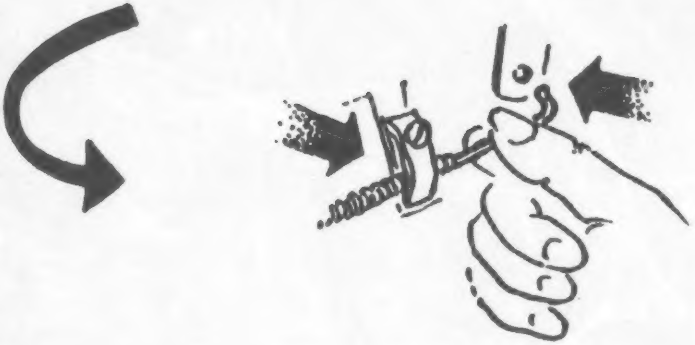
13. WHEN PUTTING TOGETHER THE CARBURETOR, BE SURE TO SET THE FLOAT AT RIGHT HEIGHT.

14. REPLACE THE IDLE NEEDLE: TURN IT ALL THE WAY AND THEN, BACK IT UP 1 1/2 TURNS.



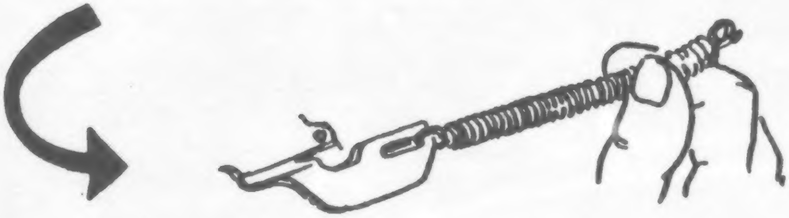
JOB STEPS

15. PUT THE GOVERNOR LINKAGE AND SPRING BACK ON.



16. BOLT THE CARBURETOR TO THE MANIFOLD OR BLOCK.

17. REPLACE THE THROTTLE CONTROL LINK AND THE CHOKE LINKAGE.



TURN PAGE →

JOB STEPS

18. PUT FUEL LINE BACK ONTO THE CARBURETOR. BE SURE THERE ARE NO LEAKS.

19. PUT ON AIR FILTER, IF YOU HAVE ONE.

20. GET YOUR INSTRUCTOR. THEN, START AND ADJUST THE CARBURETOR ACCORDING TO THE MANUAL AND THE JOB STEPS IN MOD 6501 05 007.

small engine repair

unit: CARBURETOR

capital area career center

module: 7501 05 005 7 **date:** 7/77 **level:**

skill title: REMOVE AND REPLACE CARBURETOR

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE AND REPLACE A CARBURETOR ON AN AIR-COOLED ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

AN AIR-COOLED ENGINE WITH A VANE GOVERNOR.

HAND TOOLS

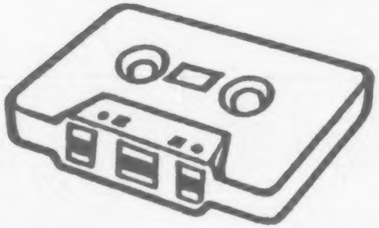
A MANUAL FOR THE KIND OF ENGINE ON WHICH YOU ARE WORKING.

WORD GUIDE

LINKAGE - PARTS WHICH CONNECT OTHER PARTS TOGETHER.

WE WILL KNOW YOU CAN DO IT WHEN:

THE CARBURETOR IS MOUNTED SO THERE ARE NO LEAKS, THE LINKAGE WORKS PROPERLY, AND THE ENGINE RUNS WELL AFTER THROTTLE AND GOVERNOR ADJUSTMENT.



A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

IN THIS MODULE, YOU ARE GOING TO LEARN HOW TO REMOVE AND REPLACE A CARBURETOR ON AN AIR-COOLED ENGINE. THERE ARE MANY DIFFERENT KINDS OF ENGINES SO YOU WILL NEED A SERVICE MANUAL FOR THE KIND OF ENGINE ON WHICH YOU ARE WORKING. READ _AIR COOLED ENGINE MECHANICS TRAINING MANUAL_, PP. 33-35.

WHEN YOU REPLACE A CARBURETOR YOU SHOULD ALSO PUT IN A NEW GASKET. THIS WILL HELP SEAL THE CARBURETOR TO THE BLOCK.

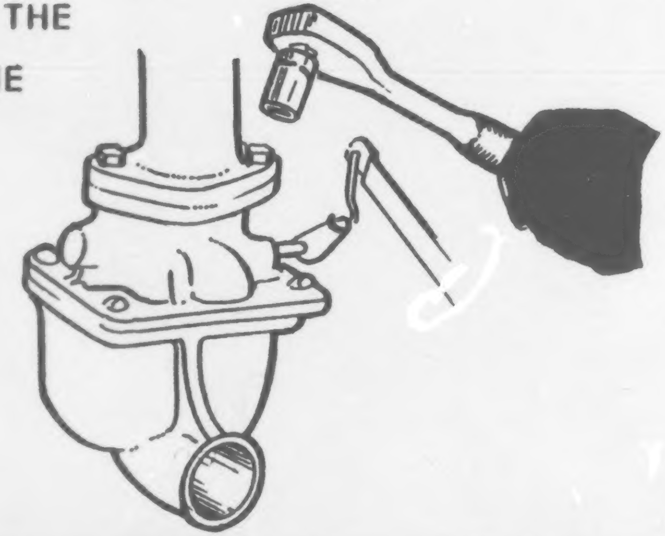
WHEN YOU GET READY TO ADJUST THE CARBURETOR WITH THE ENGINE RUNNING, REFER TO MODULE 7501 05 007 7.

WORD GUIDE

GOVERNOR - DEVICE WHICH CONTROLS SPEED OR POSITION OF OTHER PARTS.

JOB STEPS

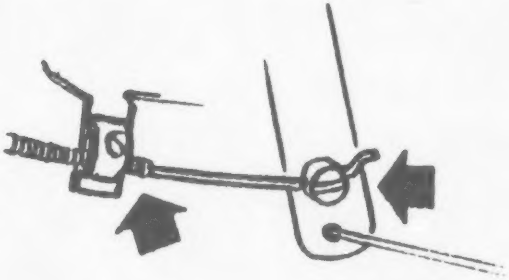
1. GET YOUR EQUIPMENT AND GO TO YOUR WORK AREA.
2. GET THE SERVICE MANUAL FOR THE KIND OF CARBURETOR ON WHICH YOU ARE WORKING. LOOK UP THE SPECIFICATIONS YOU NEED.
3. USING A SOCKET-SET WRENCH, REMOVE THE NUTS THAT HOLD THE CARBURETOR TO THE BLOCK.

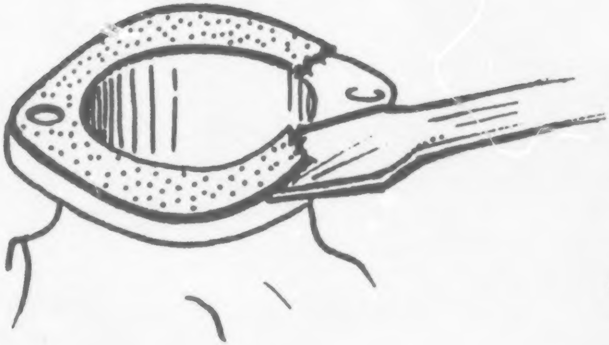


JOB STEPS

4. UNHOOK THE GOVERNOR CONTROL LINK AND SPRING.

5. USING NEEDLE-NOSE PLIER, REMOVE THE THROTTLE AND CHOKE LINKAGE.





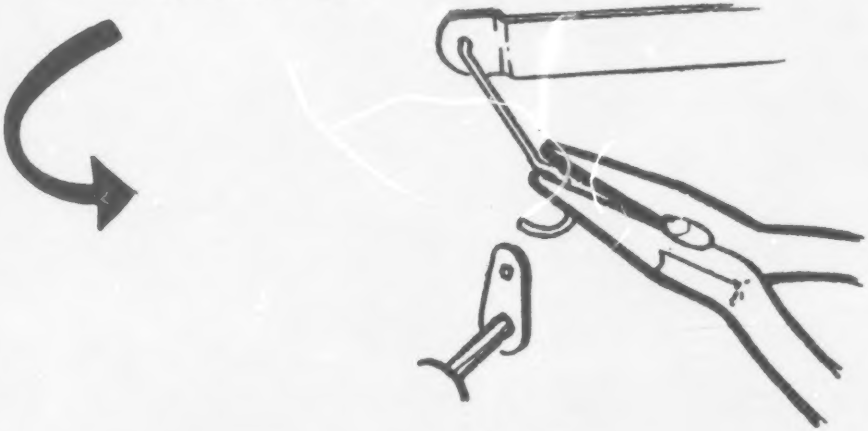
6. USING GASKET SCRAPER, CLEAN THE OLD GASKET.

7. PUT THE THROTTLE AND CHOKE LINKAGE ONTO THE NEW CARBURETOR.

TURN PAGE →

JOB STEPS

8. PUT THE GOVERNOR LINKAGE ONTO THE CARBURETOR.



9. BOLT THE NEW CARBURETOR ONTO THE BLOCK. BE SURE TO PUT IN THE NEW GASKET.

10. START THE ENGINE AND LET IT WARM UP.

11. ADJUST THE NEW CARBURETOR FOR PROPER ENGINE OPERATION. USE THE INFORMATION YOU LEARNED IN MODULE 7501 05 007 7.

small engine repair

unit: CARBURETORS

capital area career center

module: 7501 05 007 7 date: 5-4-77 level: 1

skill title: ENGINE RUNNING - HIGH AND LOW SPEED ADJUSTMENTS

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO ADJUST A CARBURETOR ON A RUNNING BRIGGS AND STRATTON 2-CYCLE ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

- BRIGGS AND STRATTON ENGINE
- HAND TOOLS
- SAFETY GLASSES
- BRIGGS AND STRATTON MANUAL

WE WILL KNOW YOU CAN DO IT WHEN:

YOU COMPLETE THE JOB STEPS SO THAT THE ENGINE RUNS SMOOTHLY WITHIN THE R.P.M. LIMIT SPECIFIED BY THE MANUFACTURER.

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

ALL CARBURETORS SHOULD BE ADJUSTED FOR SMOOTH, ECONOMICAL PERFORMANCE.

MOST CARBURETORS HAVE THREE ADJUSTMENTS:

1) IDLE SPEED

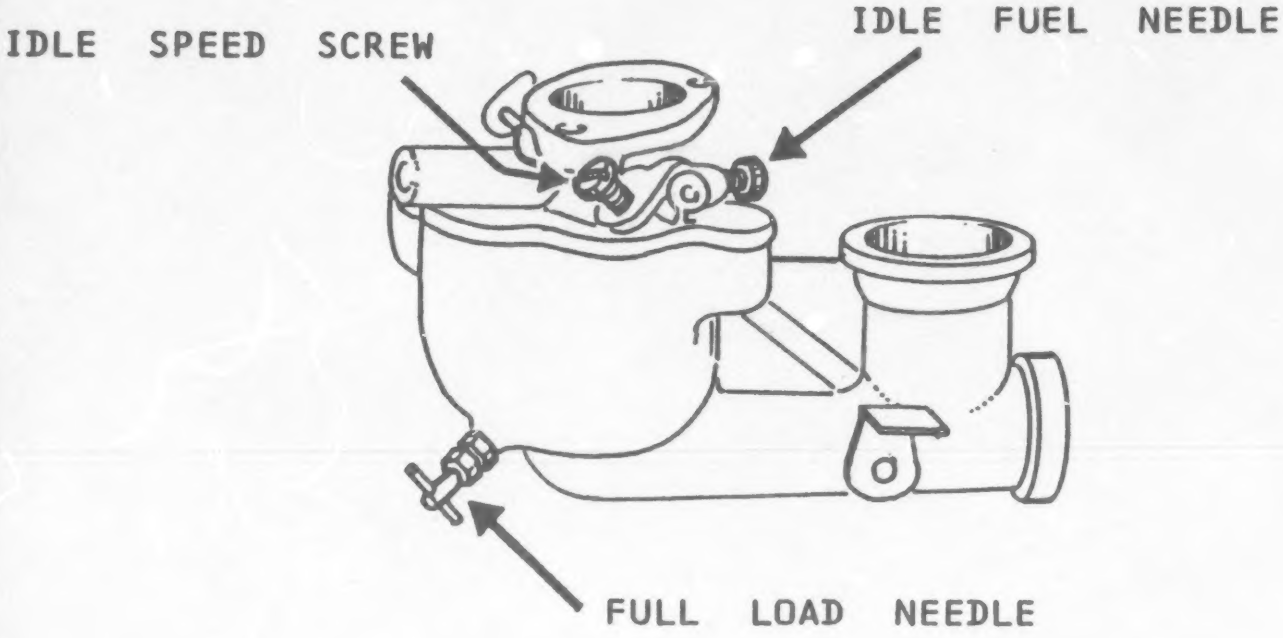
2) IDLE FUEL

3) FULL LOAD FUEL

THE BASIC ADJUSTMENT PROCEDURE IS THE SAME FOR ALL CARBURETORS. DIFFERENT KINDS OF CARBURETORS MIGHT HAVE SMALL CHANGES IN THE BASIC PROCEDURE.

INFORMATION

THE PICTURE BELOW ILLUSTRATES CARBURETOR PARTS YOU WILL NEED TO KNOW IN ORDER TO MAKE AN ADJUSTMENT.


IDLE SPEED SCREW
IDLE FUEL NEEDLE
FULL LOAD NEEDLE

JOB STEPS

1. GET EQUIPMENT FROM INSTRUCTOR. BE SURE THE ENGINE RUNS.

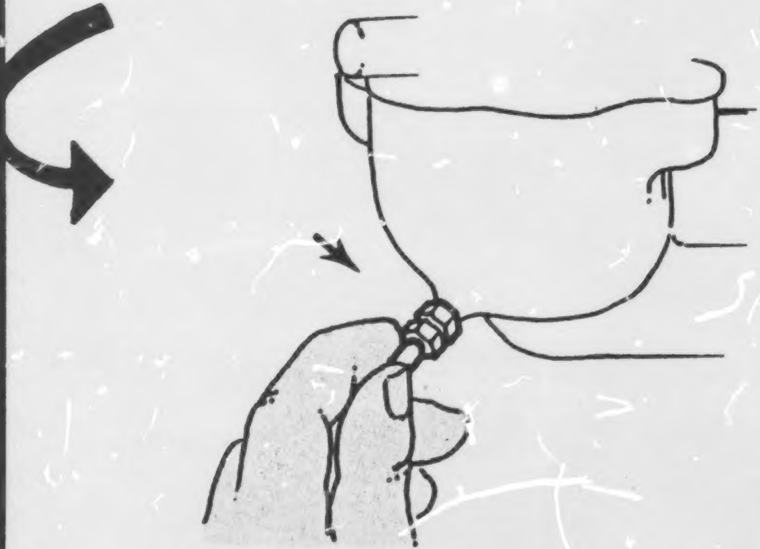
2. CHECK MANUAL FOR YOUR ENGINE'S ADJUSTMENT SPECIFICATIONS.

3. START THE ENGINE AND LET IT WARM UP.

4. RUN THE ENGINE UNDER FULL LOAD, AT OPERATING SPEED.

JOB STEPS

5. TURN IN SCREW FOR FULL LOAD NEEDLE UNTIL THE ENGINE STARTS TO MISS OR RUN UNEVENLY.



6. TURN OUT THE SCREW UNTIL THE ENGINE RUNS SMOOTHLY OR EVENLY.

JOB STEPS

7. SLOW THE ENGINE TO IDLE SPEED.

8. ADJUST THE SCREW FOR IDLE SPEED UNTIL THE ENGINE IS RUNNING AT SPECIFIED R.P.M.

9. ADJUST THE SCREW FOR IDLE FUEL MIXTURE UNTIL ENGINE IDLES SMOOTHLY. TURN THE SCREW IN UNTIL THE ENGINE RUNS ROUGHLY.

10. TURN OUT SCREW FOR IDLE SPEED UNTIL THE ENGINE RUNS SMOOTHLY.

11. CHECK THE IDLE SPEED AGAIN. IF NECESSARY, RESET IDLE SPEED.

WORD GUIDE

GOVERNOR - DEVICE WHICH LIMITS THE SPEED AN ENGINE RUNS.

JOB STEPS

12. CHECK THE OPERATION OF THE SPEED CONTROL. THE ENGINE SHOULD GO FROM IDLE TO FULL SPEED WITHOUT SPUTTERING OR HESITATING.

13. IF THE GOVERNOR DOES NOT WORK PROPERLY, RESET IT USING THE PROCEDURE YOU LEARNED IN MODULE 7501 05 006 7.

small engine repair

unit: ELECTRICAL

capital area career center

module: 7501 06 001 7

date: 2/77

level: II

skill title: CHECKING AN ELECTRIC START SYSTEM

developed & written by: DENNIS PARKER

visuals by: DAVE WEHRWEIN

WORD GUIDE

BRIDGING CIRCUITS - A METHOD USED TO BYPASS PARTS OF THE ELECTRICAL CIRCUIT FOR EXAMPLE, THE SOLENOID OR STARTER SWITCH.

SOLENOID - A MAGNETIC SWITCH.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO CHECK THE ELECTRICAL STARTING SYSTEM, INCLUDING: THE PROPER WIRING, THE OPERATION OF THE STARTER SWITCH AND SOLENOID, AND HOW TO CHECK THE COMPLETENESS OF THE SYSTEM'S CIRCUITS BY BRIDGING THE COMPONENTS IN THAT SYSTEM.

WORD GUIDE

VOLT-OHMMETER - A METER USED TO MEASURE VOLTAGE OR RESISTANCE OF ELECTRICAL COMPONENTS.

AND IN ORDER TO DO THIS YOU WILL NEED:

TWELVE VOLT STARTING SYSTEM

ONE VOLT-OHMMETER

ONE SCREWDRIVER SET

ONE SOCKET SET

ONE OPEN-END WRENCH SET

SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

THE ELECTRICAL SYSTEM YOU HAVE CHECKED IS A COMPLETED CIRCUIT AND STARTS THE ENGINE.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

BEFORE YOU START, BE SURE YOU KNOW THE ANSWER TO THESE QUESTIONS:

1. WHAT MAKE OF ENGINE ARE YOU WORKING WITH?
2. WHAT TYPE OF STARTING SYSTEM DOES YOUR ENGINE USE?
   A. STARTER-GENERATOR WITH MANUAL START SWITCH.
   B. STARTER-GENERATOR WITH SOLENOID AND KEY START.

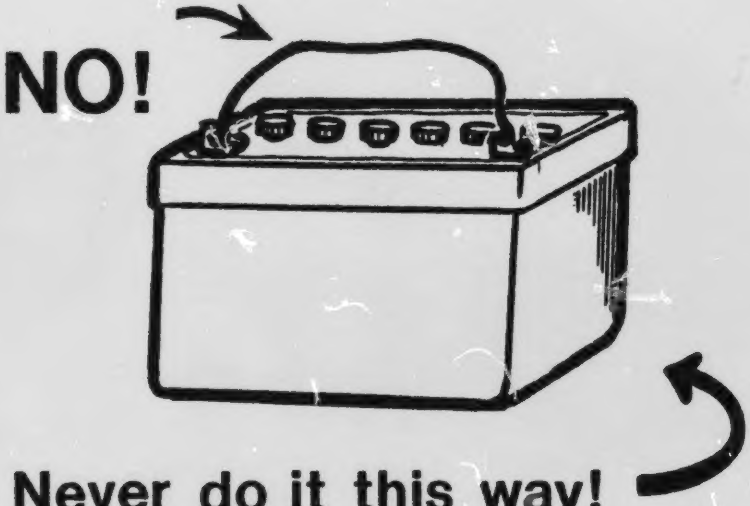
FOR INSTANCE, SEE THE BRIGGS & STRATTON SECTION ON STARTERS, PAGE 9.

NOW DO

READ THE SECTION IN THE REPAIR MANUAL THAT TELLS ABOUT YOUR ENGINE STARTER SYSTEM. THIS WILL HELP YOU TO LEARN THE LOCATION OF THE DIFFERENT PARTS IN THAT PARTICULAR SYSTEM.

INFORMATION

CAUTION! THE BATTERY YOU ARE USING CONTAINS ACID. DO NOT GET THIS ACID ON YOUR HANDS OR CLOTHES OR IN YOUR EYES. ALSO, DO NOT CONNECT A JUMPER WIRE ON THE BATTERY. THE BATTERY MAY EXPLODE.



Never do it this way!

JOB STEPS

1. BE SURE THAT YOU HAVE LEARNED THE LAYOUT OF THE STARTER SYSTEM.

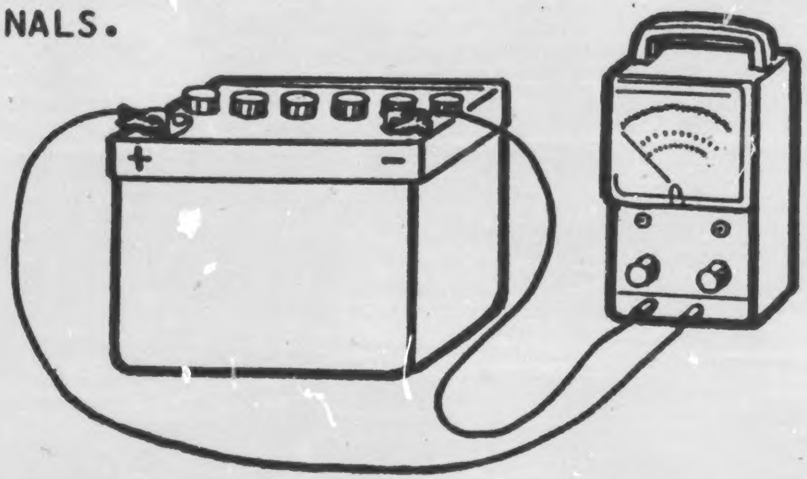
****

CAUTION! BEFORE STARTING TO WORK, DISCONNECT THE SPARK PLUG WIRE.

****

2. IS YOUR BATTERY GOOD? CHECK IT WITH THE VOLT-OHMMETER. SET THE METER FOR VOLTS AND CHECK ACROSS THE BATTERY TERMINALS.

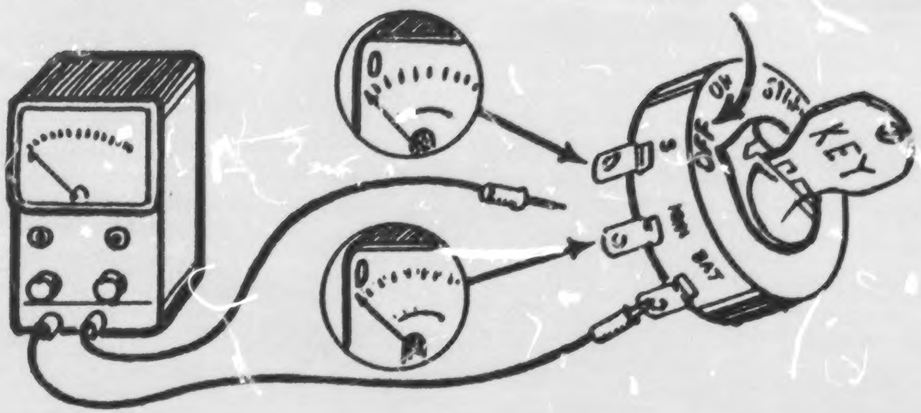
IF YOU DON'T REMEMBER HOW, CHECK MODS
7401 07 001 7,
7401 07 002 7,
7401 07 003 7,
7401 07 005 7.

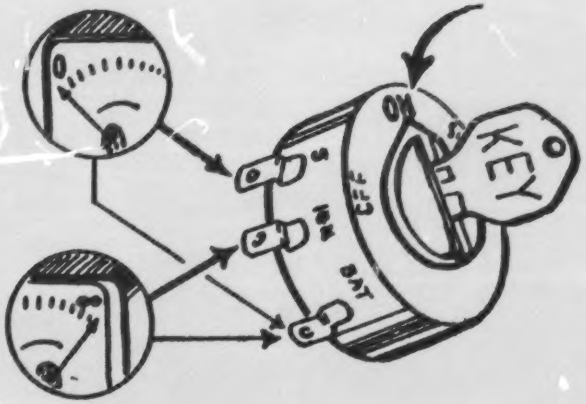


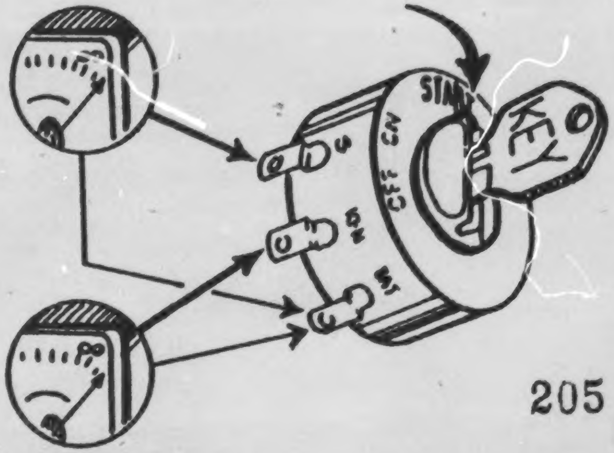
IF YOU DON'T REMEMBER HOW TO USE THE VOLT-OHMMETER ASK THE INSTRUCTOR FOR HELP.

JOB STEPS

3. WITH THE BATTERY DISCONNECTED CHECK THE CIRCUIT OF THE STARTER SWITCH WITH VOLT-OHMMETER. (SET TO RESISTANCE) WITH THE SWITCH "OFF," THERE SHOULD BE NO CONNECTION BETWEEN ANY OF THE TERMINALS ON THE SWITCH. SET THE SWITCH TO "ON." YOU SHOULD FIND A CONNECTION BETWEEN THE BATTERY TERMINAL AND THE IGNITION TERMINAL. HOLD THE SWITCH TO THE "START" POSITION. ALL THE TERMINALS SHOULD SHOW CONNECTIONS BETWEEN EACH OTHER.


OFF
ON
START
KEY
S
IGN
BAT

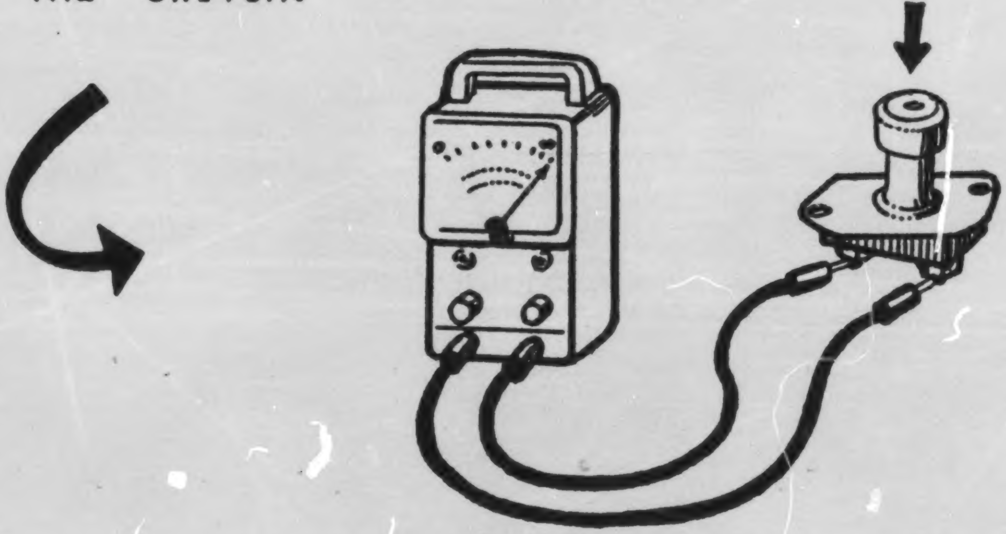

ON
OFF
KEY
S
IGN
BAT


START
ON
OFF
KEY
S
IGN
BAT

JOB STEPS

4. IF YOU DO NOT GET THE SAME RESULTS ASK THE INSTRUCTOR FOR A NEW SWITCH.

5. TO CHECK THE MANUAL STARTER SWITCH, PUSH THE SWITCH BUTTON AND CHECK FOR CONNECTION ON THE BIG TERMINALS OF THE SWITCH.



IF YOU DON'T GET THE SAME READING ASK THE INSTRUCTOR FOR A NEW SWITCH.

small engine repair

unit: TEST EQUIPMENT

capital area career center

module: 7501 13 003 7 date: 6/77 level: I

skill title: COIL SURFACE INSULATION TEST

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TEST A COIL FOR SURFACE INSULATION DEFECTS ON A 298654 COIL.

IN ORDER TO DO THIS YOU WILL NEED:

COIL - 298654	SAFETY GLASSES
MERCOTRONIC TESTER	

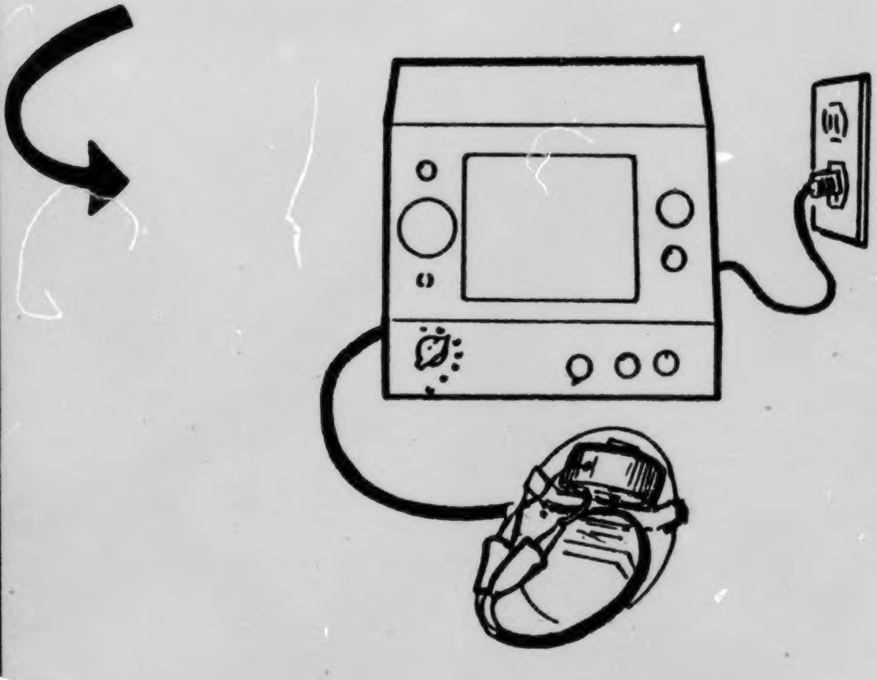
WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE TESTED A 298654 COIL FOR DEFECTS IN SURFACE INSULATION, ACCORDING TO SERVICE SPECIFICATIONS.

A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

INSULATION ON SOME COILS WILL BREAK DOWN OR ROT AWAY. WHEN THIS HAPPENS, THE COIL CAN SHORT OUT BECAUSE NO CURRENT WILL GO TO THE SPARK PLUG. YOU CONNECT THE METER TO THE COIL LIKE THE PICTURE BELOW SHOWS.



INFORMATION

SOMETIMES, YOU SEE A FAINT SPARK AROUND THE COIL INSULATION DURING THE TEST. THIS IS CALLED A "CORONA" SPARK. THIS DOES NOT MEAN THE COIL IS BROKEN, ROTTEN, OR FAULTY. BE SURE NOT TO HOLD THE TEST PROBE TOO LONG IN ONE PLACE.

COMPLETE THIS TEST AS FAST AS YOU CAN.

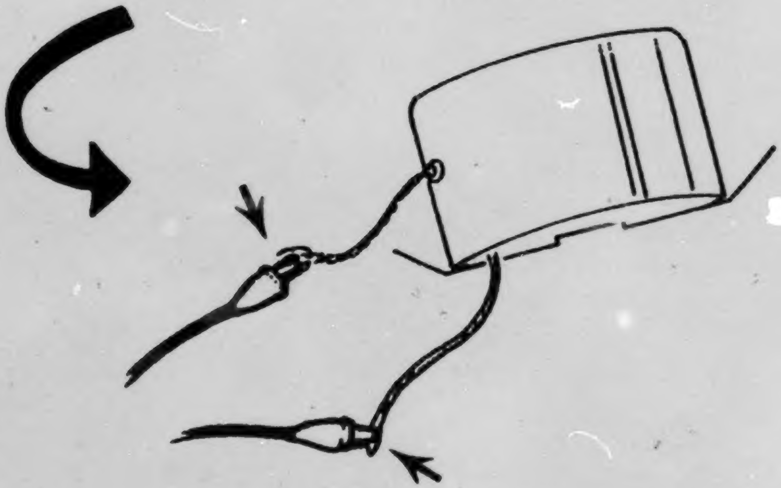
CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

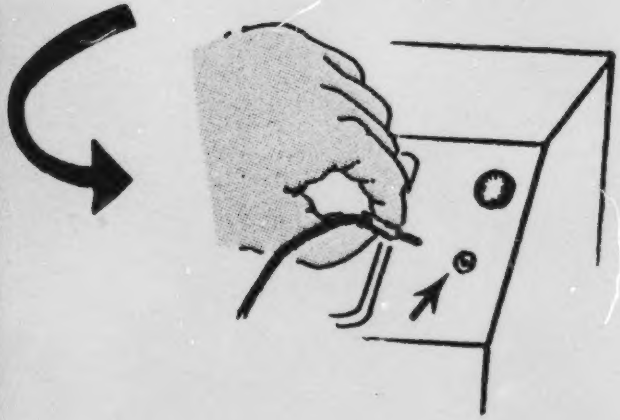
2. PLUG MERCOTRONIC TESTER INTO 115 V. OUTLET.

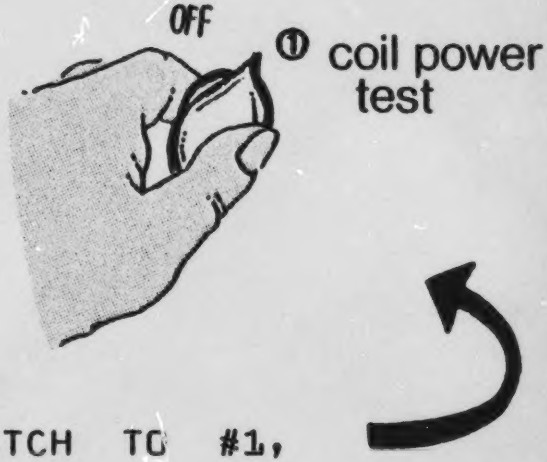
3. CONNECT SMALL RED LEAD TO COIL PRIMARY LEAD OR BREAKER POINT TERMINAL. CLIP THE BLOCK TEST LEAD TO COIL PRIMARY GROUND WIRE.



JOB STEPS

4. PLUG THE INSULATION TEST PROBER INTO THE "JACK" ON THE FRONT OF THE TESTER.



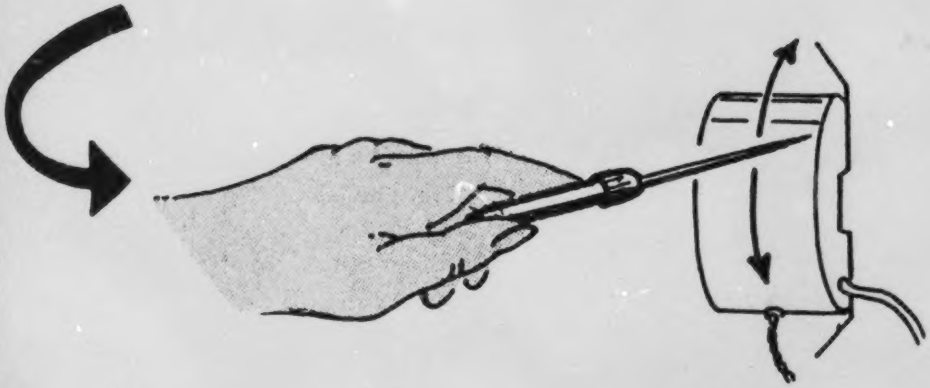


5. TURN THE SELECTOR SWITCH TO #1, "COIL POWER TEST".

6. TURN CURRENT CONTROL KNOB TO "HIGH" AND FIND MAXIMUM CURRENT READING. DO NOT TURN THE CURRENT CONTROL KNOB SO THE METER READS OFF THE SCALE.

JOB STEPS

7. PASS THE END OF THE INSULATION TEST PROBE OVER THE INSULATED SURFACE OF THE COIL AND SPARK PLUG WIRES.



8. IF YOU SEE A SPARK DISCHARGE, THE INSULATION IS CRACKED.

9. TURN THE CURRENT CONTROL KNOB TO THE "LD" POSITION.

JOB STEPS

10. TURN THE SELECTOR SWITCH TO "OFF".

11. DISCUSS THE TEST RESULTS WITH YOUR INSTRUCTOR.

small engine repair

unit: TEST EQUIPMENT

capital area career center

module: 7501 13 005 7 date: 6/77 level: I

skill title: DYNAMOMETER - MARK II

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TEST A SNOWMOBILE ON THE MARK II DYNAMOMETER.

AND IN ORDER TO DO THIS YOU WILL NEED:

- A SNOWMOBILE THAT RUNS
- A DYNAMOMETER
- SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE TESTED A SNOWMOBILE ON THE DYNAMOMETER TO BE SURE IT RUNS ACCORDING TO SERVICE MANUAL SPECIFICATIONS.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

THE MARK II DYNAMOMETER IS A DEVICE DESIGNED TO TEST A SNOWMOBILE UNDER VERY COLD CONDITIONS.

WHEN YOU PUT THE SNOWMOBILE ON THE DYNAMOMETER, BE SURE THAT THE DRIVE TRACK DOES NOT OVERLAP EITHER END OF THE DYNAMOMETER.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. GO TO YOUR WORK AREA AND ASK YOUR INSTRUCTOR TO SHOW YOU WHICH SNOWMOBILE TO USE.

2. CHECK THE OIL AND GAS LEVELS IN THE SNOWMOBILE.

3. CHECK THE OIL LEVEL IN THE DYNAMOMETER BY TAKING THE OIL CAP OFF AND CHECKING TO SEE IF THE OIL TANK IS FULL.

4. ASK YOUR INSTRUCTOR OR ANOTHER STUDENT TO HELP YOU PUT THE SNOWMOBILE ONTO THE DYNAMOMETER.

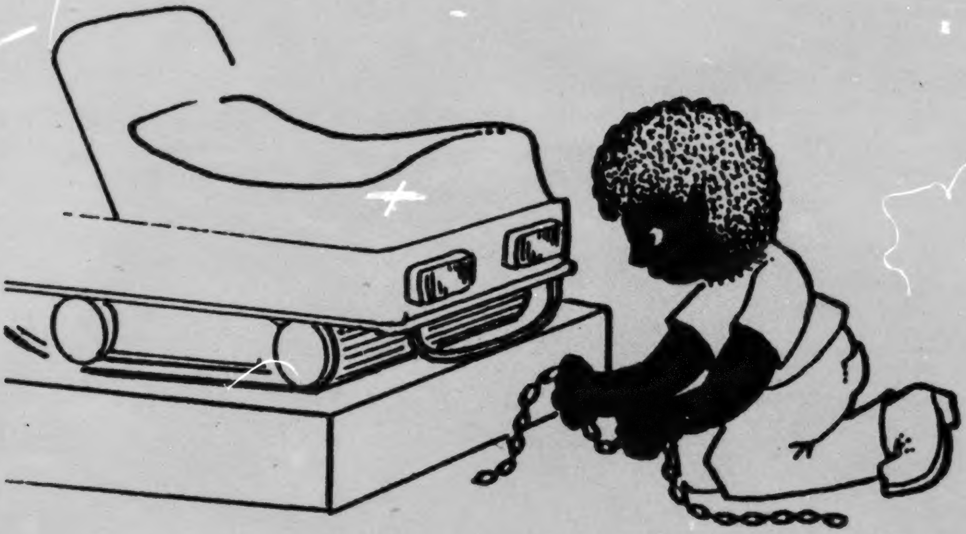
5. CHAIN DOWN THE SNOWMOBILE.

WORD GUIDE

ADVANCE - MOVE FORWA

JOB STEPS

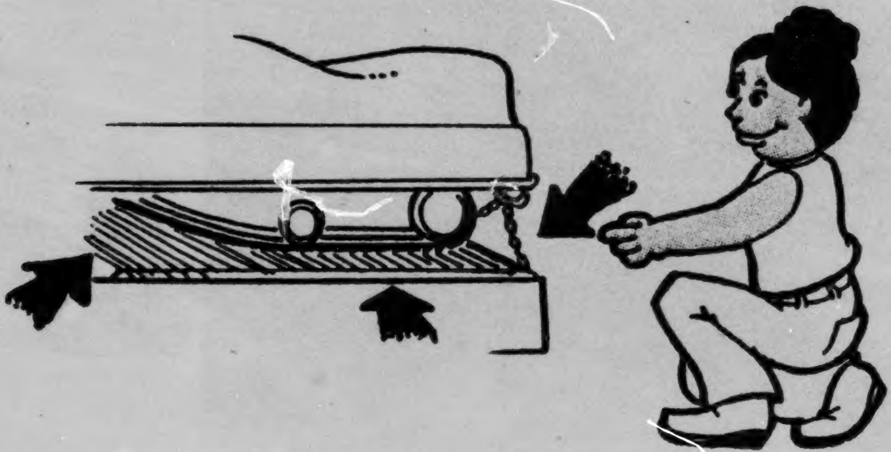
6. ATTACH THE RETAINING BAR AND THE DOWN CHAIN TO THE TOW BAR AT THE REAR OF THE SNOWMOBILE.



7. START THE SNOWMOBILE ENGINE AND SITTING ON THE MACHINE, SLOWLY ADVANCE THE THROTTLE.

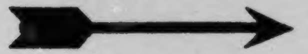
JOB STEPS

8. CHECK THE SNOWMOBILE TO BE SURE THE TRACK IS NOT TOUCHING ANY OF THE STILL FRONT ON THE DYNAMOMETER. BE SURE TO CHECK THE FRONT, BACK, AND BOTH SIDES.



9. ADVANCE THE THROTTLE TO FULL SPEED.

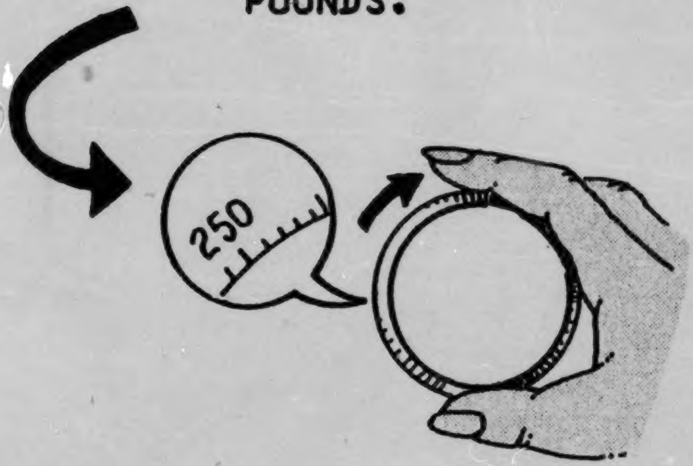
WORD GUIDE

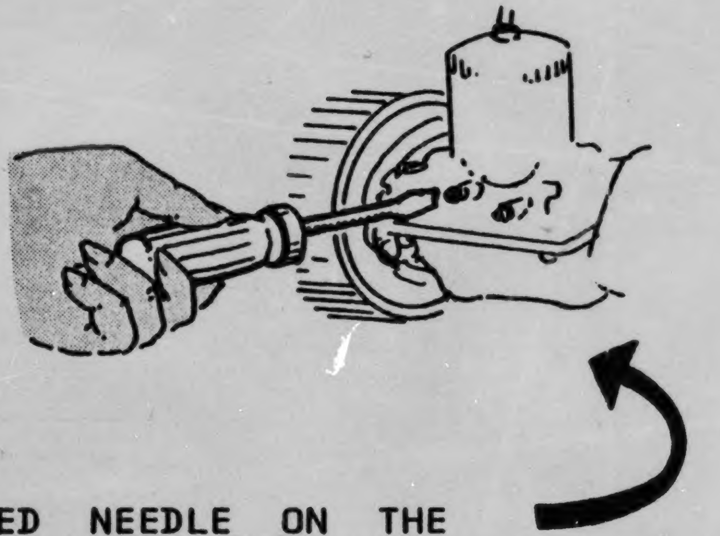


CLOCKWISE - TO THE RIGHT.

JOB STEPS

10. TURN THE PRESSURE CONTROL KNOB ON THE DYNAMOMETER CLOCKWISE UNTIL IT READS 250 POUNDS.





11. ADJUST THE HIGH SPEED NEEDLE ON THE SNOWMOBILE CARBURETOR.

JOB STEPS

12. WATCH THE SPEEDOMETER. TURN THE NEEDLE IN OR OUT UNTIL IT REACHES THE HIGHEST SPEED.

    NOTE: DO NOT TURN THE HIGH SPEED NEEDLE LESS THAN 1 1/2 TURNS. WHEN YOU ARE FINISHED ADJUSTING THE NEEDLE, THE SPEED SHOULD STAY STEADY.

13. TURN THE PRESSURE CONTROL KNOB TO 500 POUNDS PRESSURE. CHECK THE SPEEDOMETER TO SEE THAT THE SPEED STAYS STEADY.

14. SHUT OFF THE DYNAMOMETER PRESSURE CONTROL AND SLOW THE SNOWMOBILE TO IDLE.

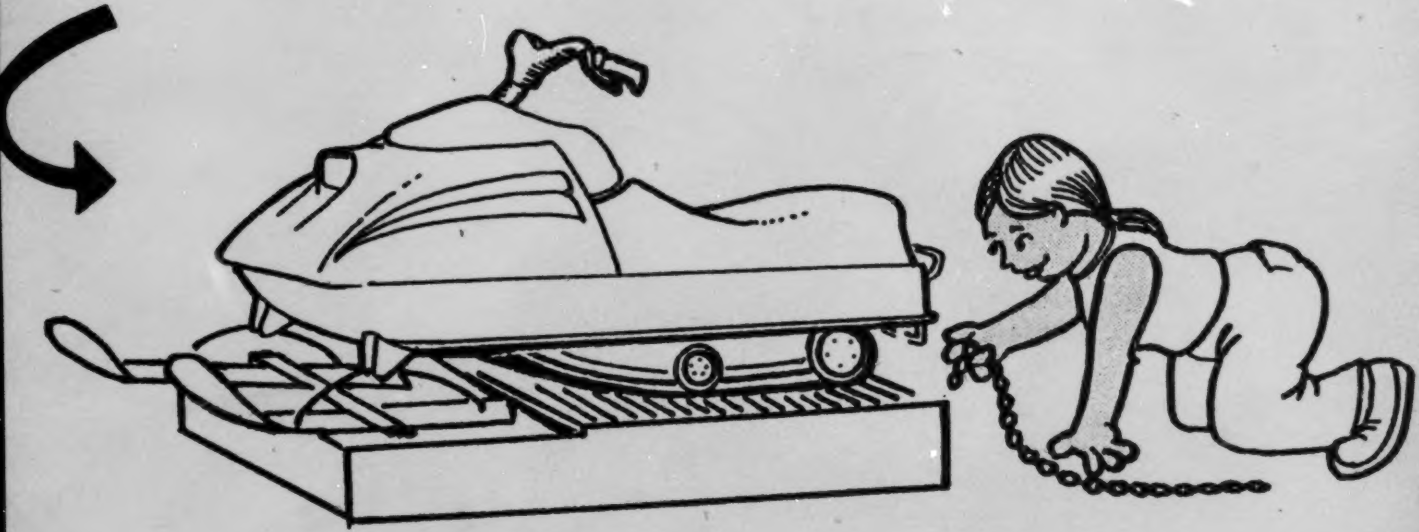
15. SHUT OFF THE SNOWMOBILE.

TURN PAGE →

JOB STEPS

16. REMOVE THE TIE-DOWN CHAIN AND RETAINING BAR.

17. REMOVE THE HOLD CHAINS.



18. ASK SOMEONE TO HELP YOU LIFT THE SNOWMOBILE OFF THE DYNAMOMETER.

19. CLEAN THE SNOWMOBILE SO IT CAN BE DELIVERED TO THE CUSTOMER.

small engine repair

unit: TEST EQUIPMENT

capital area career center

module: 7501 13 006 7 **date:** 6/77 **level:** I

skill title: CONDENSER LEAK AND SHORTAGE TEST

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TEST A CONDENSER WITH A MERCOTRONIC TESTER FOR LEAKS AND SHORTS.

AND IN ORDER TO DO THIS YOU WILL NEED:

CONDENSER

MERCOTRONIC TESTER

SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE TESTED THE CONDENSER WITH A MERCOTRONIC TESTER FOR LEAKS OR SHORTS (ACCORDING TO SERVICE SPECIFICATIONS).

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

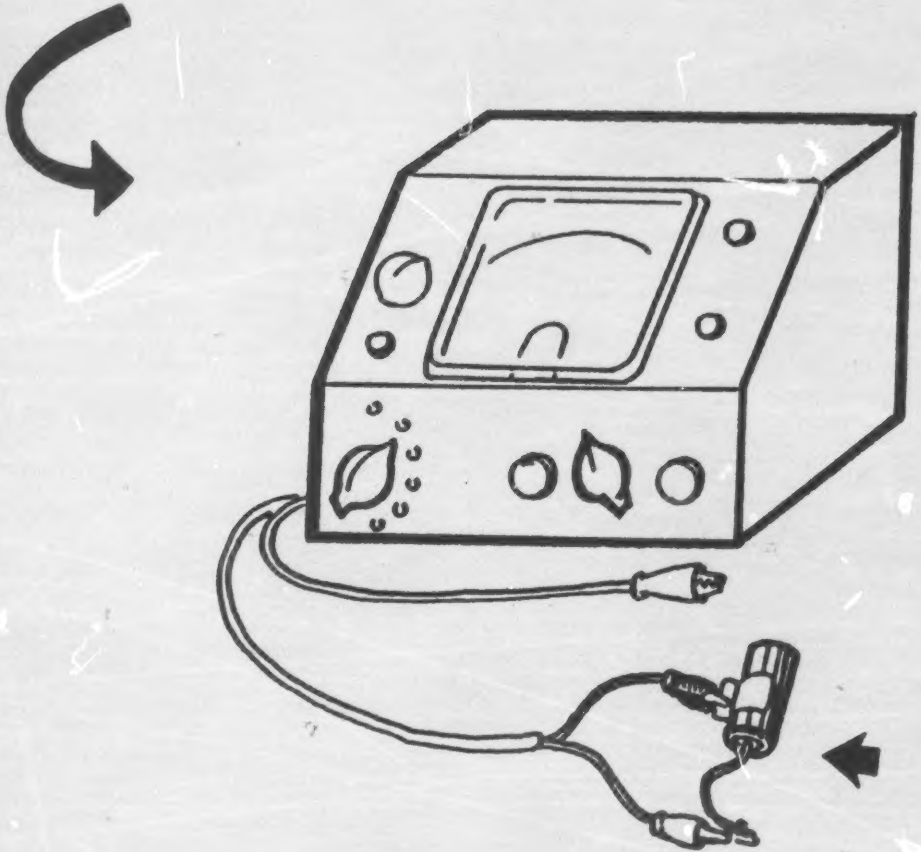
YOU ARE GOING TO TEST A CONDENSER FOR LEAKS OR SHORTS. IN EITHER CASE, THE CONDENSER WILL NOT WORK PROPERLY. THIS WILL CAUSE THE POINTS TO BURN UP AND THE ENGINE TO QUIT RUNNING. FOR THIS TEST, YOU CAN HAVE THE CONDENSER EITHER ON OR OFF THE MAGNETO.

IF YOU HAVE A FAIRBANKS - MORSE MAGNETO, YOU MUST REMOVE THE CONDENSER LEAD FROM THE BREAKER POINT TERMINAL. THE CONDENSER SHOULD BE TAPED AGAINST AN INSULATED BOARD SO A LOOSE ELEMENT CONDITION WILL SHOW UP.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

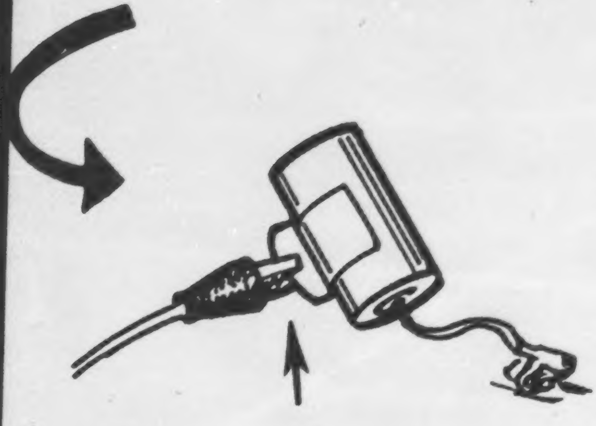
THE TESTER IS CONNECTED TO THE CONDENSER AS SHOWN IN THE PICTURE BELOW.

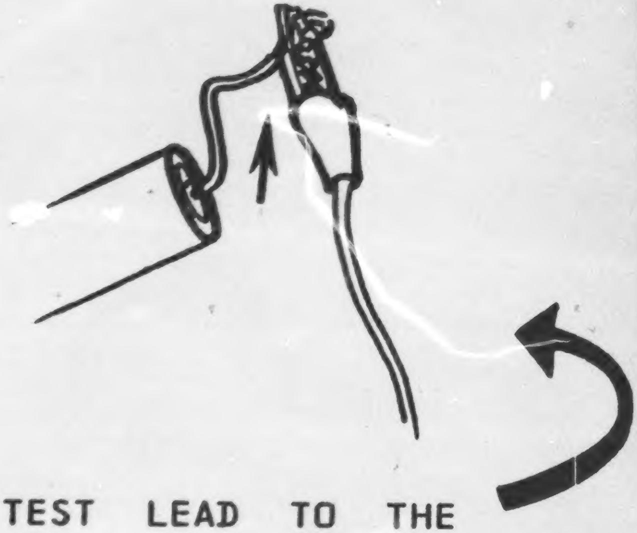


JOB STEPS

1. GET ALL EQUIPMENT AND TAKE IT TO YOUR WORK AREA.

2. CLIP THE SMALL BLACK TEST LEAD TO THE STATOR PLATE OR BODY OF THE CONDENSER.

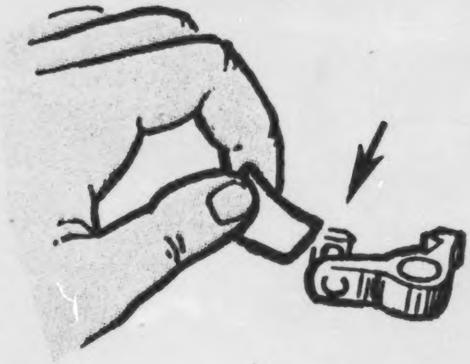




3. CLIP THE SMALL RED TEST LEAD TO THE BREAKER TERMINAL OR CONDENSER LEAD.

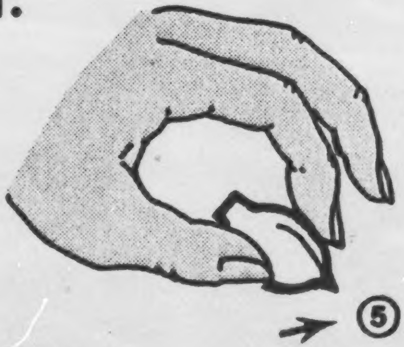
JOB STEPS

4. BE SURE THERE IS CARDBOARD BETWEEN THE PARTS.



5. PLUG THE TESTER INTO A 115 VOLT OUTLET.

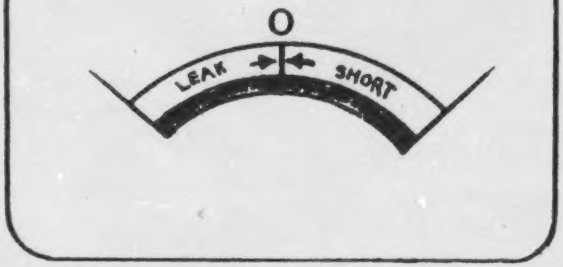
6. TURN SELECTOR SWITCH TO #5 "LEAKAGE" AND SHORT POSITION.



JOB STEPS

7. LOOK AT SCALE #5. THEN, PUSH DOWN THE RED BUTTON AND HOLD IT DOWN AT LEAST 15 SECONDS BEFORE YOU LET THE BUTTON UP.

scale #5



8. THE METER POINTER SHOULD MOVE TO THE RIGHT AND THEN LEFT TO THE ZERO LINE.

9. READINGS TO THE RIGHT OF THE ZERO LINE MEANS THE CONDENSER IS FAULTY, AND MUST BE REPLACED.

small engine repair

unit: TEST EQUIPMENT

capital area career center

module: 7501 13 007 7 date: 6/77 level: I

skill title: CONDENSER SERIES RESISTANCE TEST

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TEST A CONDENSER FOR SERIES RESISTANCE USING A MERCOTRONIC TESTER.

AND IN ORDER TO DO THIS YOU WILL NEED:

CONDENSER	SAFETY GLASSES
MERCOTRONIC TESTER	

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE TESTED A CONDENSER WITH A MERCOTRONIC TESTER TO SEE IF IT HAS SERIES RESISTANCE, ACCORDING TO SERVICE SPECIFICATIONS.

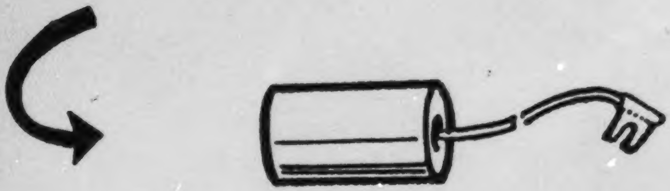
A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

SERIES RESISTANCE IS AN OPEN CIRCUIT WITHIN THE CONDENSER. CURRENT WILL NOT FLOW THROUGH AN OPEN CIRCUIT.



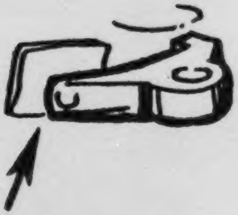
IF A CONNECTION IS LOOSE, IT CAN CREATE AN OPEN CIRCUIT BECAUSE OF VIBRATION FROM THE RUNNING ENGINE. THIS TEST CAN ALSO TELL YOU IF THE CONDENSER WILL CHARGE OR DISCHARGE (SEE MODULE 7501 13 001).

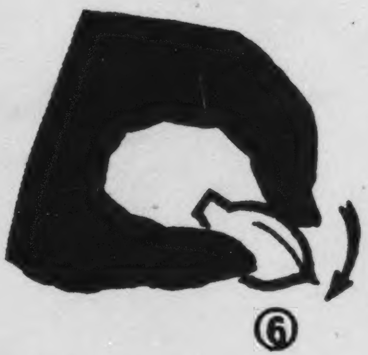
SINCE THIS IS A VERY SENSITIVE TEST, BE SURE THE METER CLIPS AND CONDENSER ARE CLEAN.

JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

2. IF THE CONDENSER IS ON A MAGNETO, LEAVE CARDBOARD BETWEEN THE BREAKER POINTS.

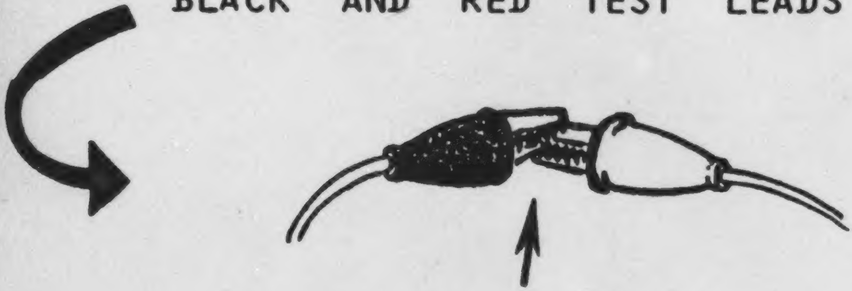




3. PUT SELECTOR SWITCH ON POSITION #6, "CONDENSER SERIES RESISTANCE".

JOB STEPS

4. TO SET THE METER, CLIP THE SMALL BLACK AND RED TEST LEADS TOGETHER.



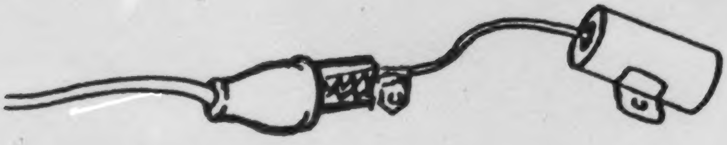
5. PLUG THE TESTER INTO A 110 VOLT OUTLET.

6. ADJUST THE METER SET SCALE 6 TO SET LINE ON RIGHT SIDE OF SCALE.

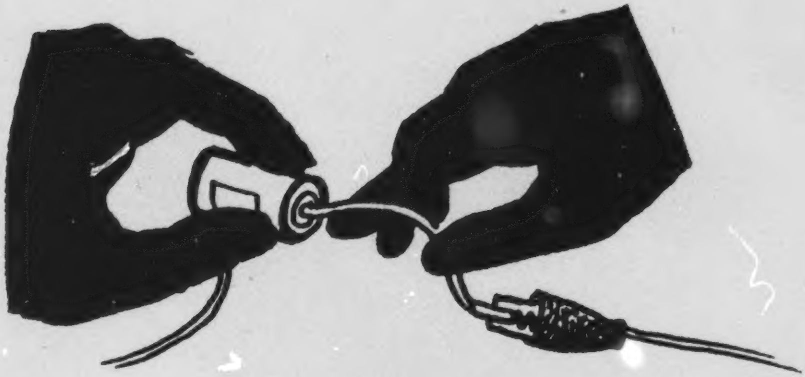
7. UNCLIP THE TEST LEADS.

JOB STEPS

8. CLIP SMALL RED TEST LEAD TO BREAKER TERMINAL OR LOOSE CONDENSER LEAD.



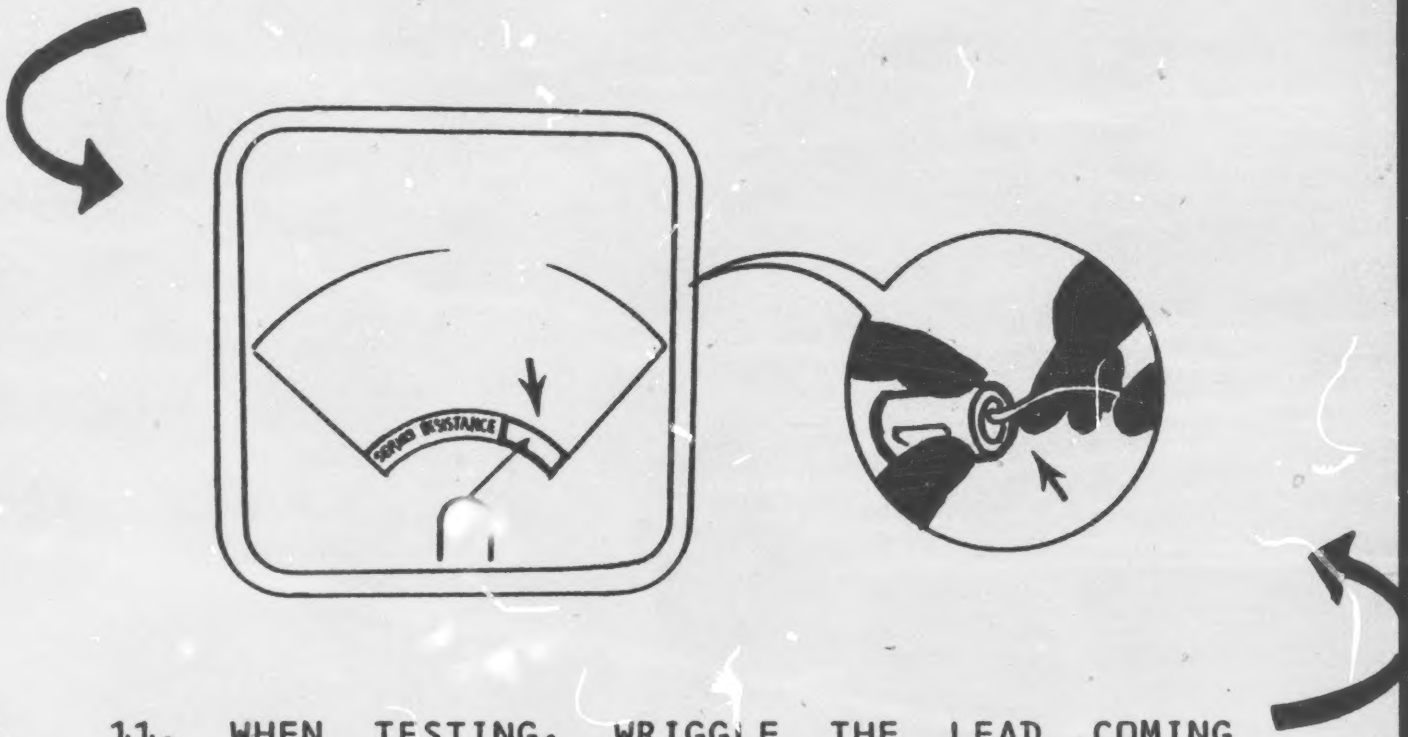
9. CLIP SMALL BLACK TEST LEAD TO STATOR PLATE OR BODY OF CONDENSER.



2

JOB STEPS

10. METER POINTER MUST BE WITHIN OK GREEN BLOCK ON SCALE #6.



11. WHEN TESTING, WRIGGLE THE LEAD COMING OUT OF THE CONDENSER. LOOK FOR MOVEMENT IN THE METER NEEDLE.

WORD GUIDE

DEFECTIVE - FAULTY, FAILING, NOT WORKING CORRECTLY.

JOB STEPS

12. IF THERE IS ANY MOVEMENT, THE CONDENSER IS "OPEN".

13. IF THE NEEDLE STAYS WITHIN THE GREEN ZONE ON THE SCALE, THE CONDENSER IS ALRIGHT.

14. IF THE METER POINTER MOVES TO THE RED SCALE ON THE METER, THE CONDENSER IS DEFECTIVE.

15. TURN THE TEST SELECTOR TO "OFF".

16. ASK THE INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: TEST EQUIPMENT

capital area career center

module: 7501 13 008 7 date: 6/77 level: I

skill title: PRIMARY RESISTANCE TEST

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

A

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO MEASURE RESISTANCE IN THE COIL USING A MERCOTRONIC TESTER.

IN ORDER TO DO THIS YOU WILL NEED:

- COIL
- SAFETY GLASSES
- MERCOTRONIC TESTER
- MERCOTRONIC TESTER MANUAL

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE TESTED THE COIL FOR RESISTANCE ACCORDING TO SERVICE SPECIFICATIONS USING A MERCOTRONIC TESTER.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

WORD GUIDE

PRIMARY - FIRST

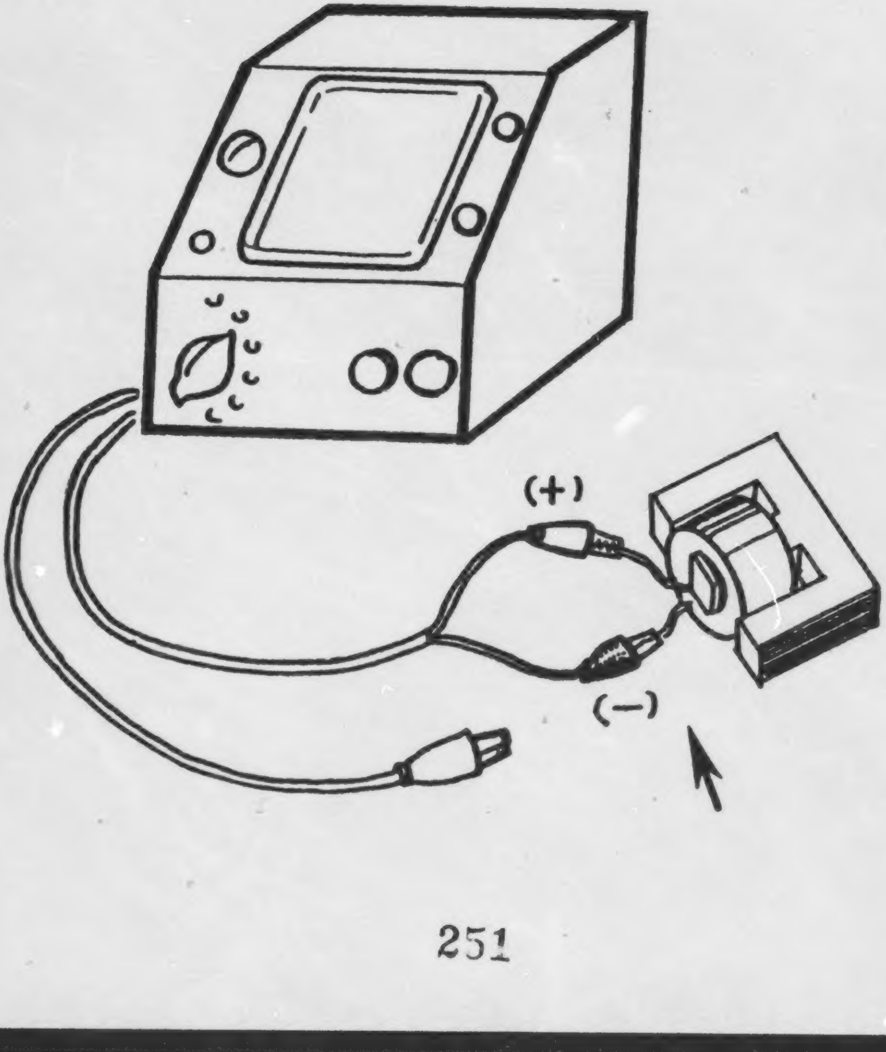
INFORMATION

RESISTANCE IS MEASURED IN OHMS. ONE OHM IS ONE UNIT OF RESISTANCE. ANY RESISTANCE STOPS THE FLOW OF CURRENT.

YOU ARE GOING TO CHECK THE COIL TO SEE IF THERE IS RESISTANCE TO THE FLOW OF CURRENT IN THE PRIMARY WINDING OF THE COIL. (SEE MODULE #7501 13 002) MAXIMUM RESISTANCE IS A COMPLETE OPEN CIRCUIT (SEE MODULE 7501 13 007). IF THE METER DOES NOT READ WITHIN THE SPECIFIED LIMIT, THEN THE COIL MUST BE REPLACED.

INFORMATION

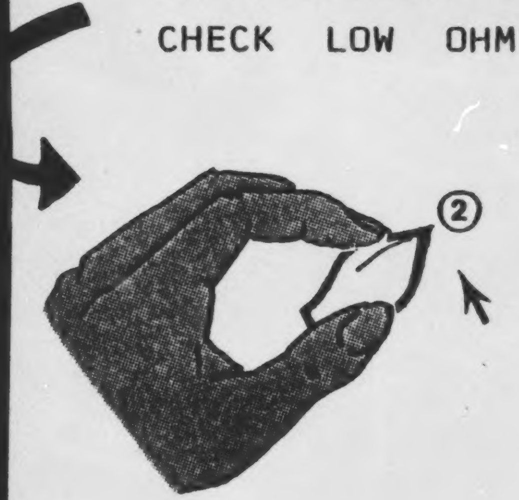
HOOK UP THE TESTER AS IN THE PICTURE BELOW.

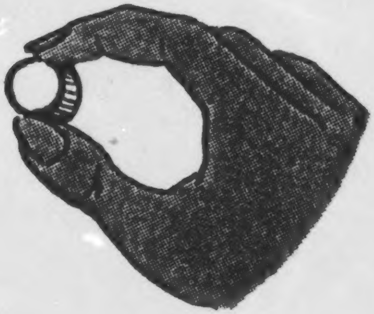


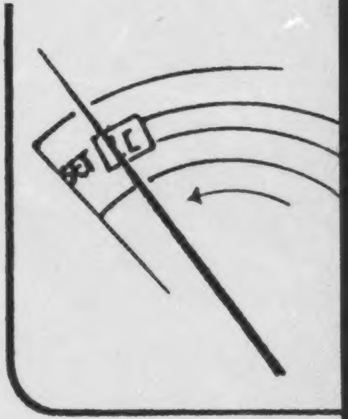
JOB STEPS

1. GET ALL EQUIPMENT AND TAKE IT TO YOUR WORK AREA.

2. TURN SELECTOR SWITCH TO POSITION #2 (DISTRIBUTOR RESISTANCE). YOU CAN NOW CHECK LOW OHM RESISTANCES.



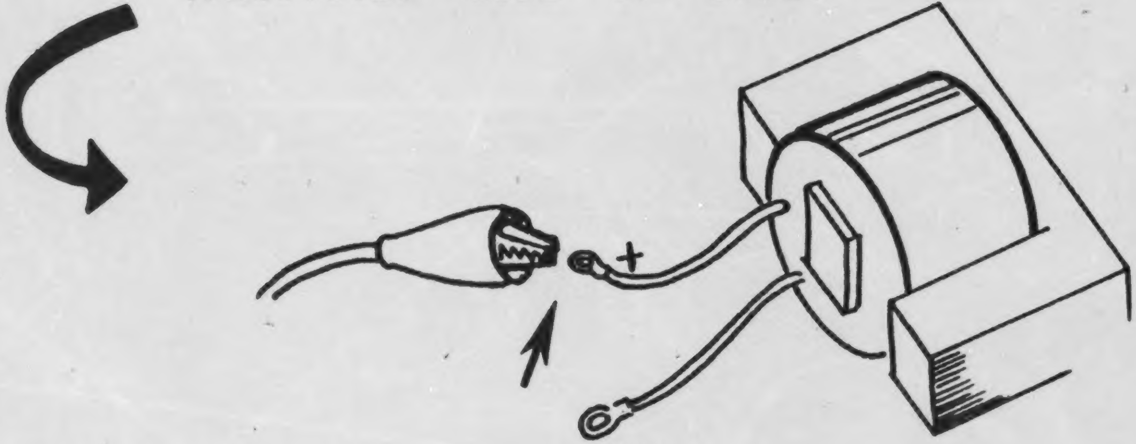




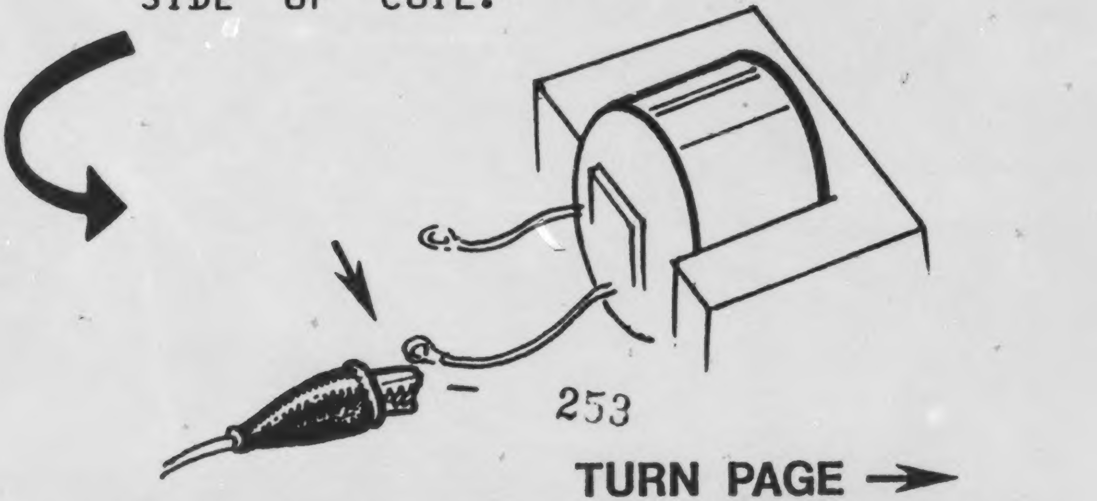
3. TURN METER ADJUSTMENT KNOBS FOR SCALE #2 UNTIL THE METER NEEDLE LINES UP ON THE SET POSITION ON THE LEFT SIDE OF SCALE #2. YOU CAN NOW CHECK RESISTANCE OF 0-30 OHMS.

JOB STEPS

4. CLIP SMALL RED TEST LEAD TO PRIMARY (POSITIVE) SIDE OF COIL.



5. CLIP SMALL BLACK TEST LEAD TO NEGATIVE SIDE OF COIL.



TURN PAGE →

JOB STEPS

6. READ SCALE #2 RESULT.

7. FOR THE 298654 COIL, THE NEEDLE SHOULD BE BETWEEN 18 - 24 OHMS. (READ THE RED NUMBERS)

   NOTE: IF YOU HAVE A DIFFERENT COIL, YOU MUST LOOK UP THE SPECIFICATIONS IN THE MERCOTRONIC MANUAL.

9. IF THE READING IS ABOVE 24 OHMS, THE WINDING IS OPEN.

10. TURN THE TEST SELECTOR TO "OFF".

11. ASK THE INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: MOTORCYCLE

capital area career center

module: 7501 14 001 7 **date:** 4/77 **level:**

skill title: TIMING A SINGLE CYLINDER (FLYWHEEL COVERING POINTS) MAGNETO SYSTEM ONLY

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

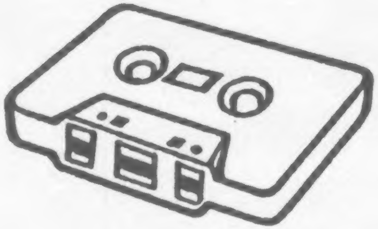
HOW TO SET POINTS AND TIME THE ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

- HAND TOOLS
- BUZZ BOX
- TIMING LIGHT
- DIAL INDICATOR
- MANUFACTURER'S MANUAL
- ONE-CYCLINDER ENGINE FLYWHEEL COVERING THE POINTS
- SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

1. YOU HAVE SET NOT MORE THAN ± .002 OFF MANUFACTURER'S SPECIFICATIONS BY USING THE BUZZ AND DIAL INDICATOR.
2. YOU LINE UP THE "HASH" MARKS ON THE ROTOR, USING A TIMING LIGHT, WHILE THE ENGINE IDLES.
3. YOU LINE UP THE HASH MARKS ON THE ROTOR LINE UP WHILE THE ENGINE RUNS AT 4,000 R.P.M.

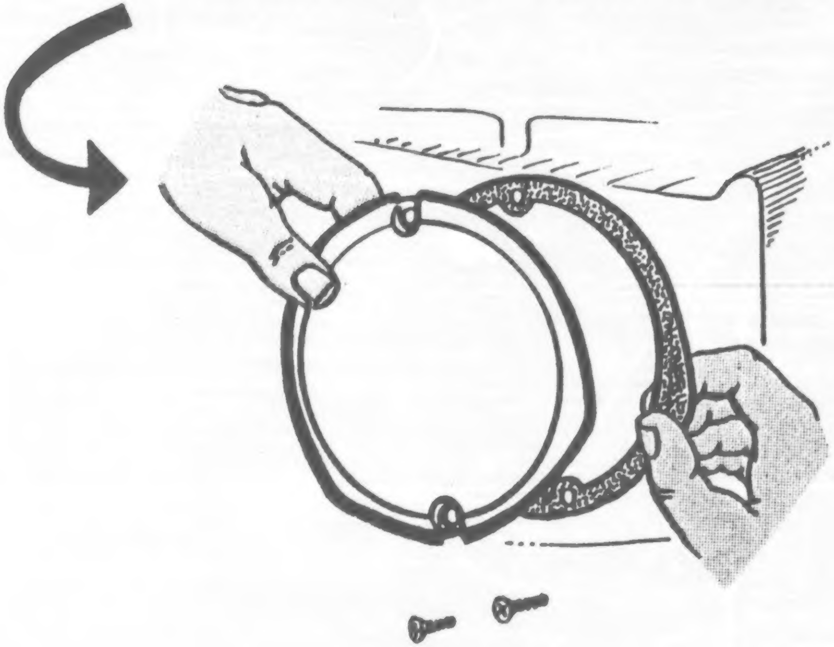


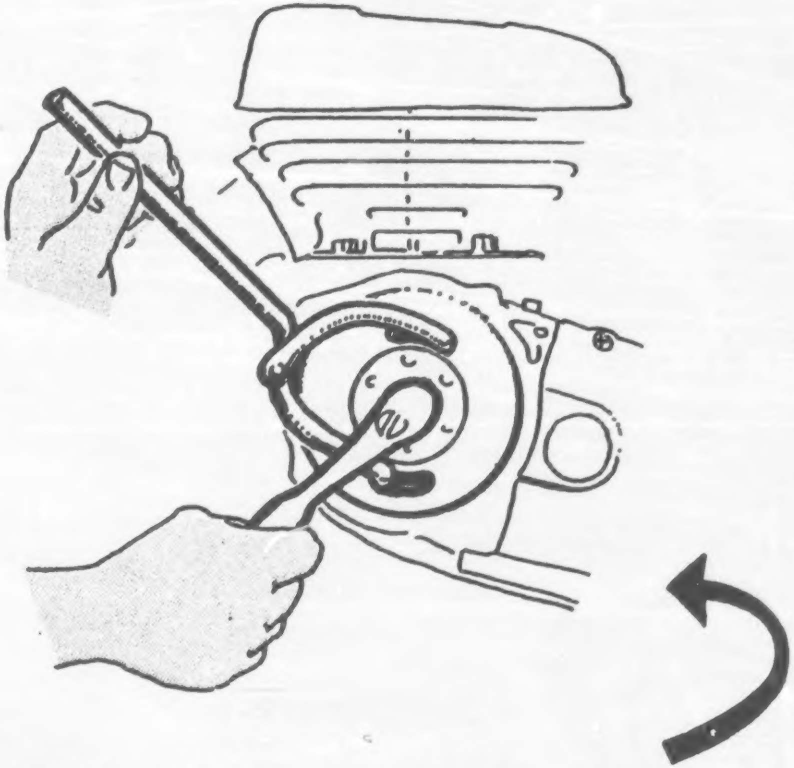
A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. USING PHILLIPS SCREWDRIVER, REMOVE THE SIDE CASE THAT COVERS THE MAGNETO (USUALLY ON THE LEFT SIDE).

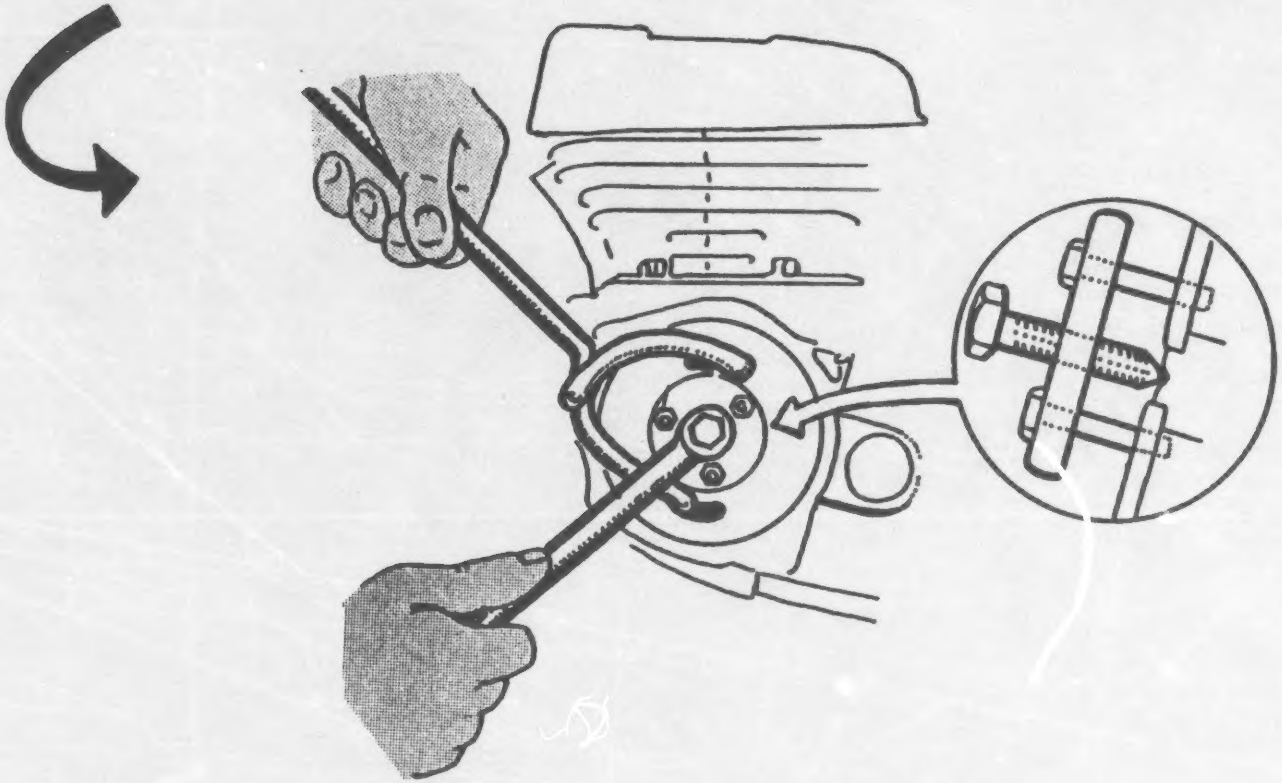




2. USING FLYWHEEL WRENCH AND METRIC SOCKET, REMOVE THE FLYWHEEL BY HOLDING IT WITH THE FLYWHEEL WRENCH AND TAKING OFF THE HOLDING NUT.

JOB STEPS

3. AGAIN USE A FLYWHEEL WRENCH TO KEEP THE FLYWHEEL FROM TURNING, USE A PULLER TO PULL THE FLYWHEEL FREE.



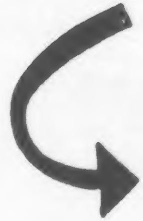
4. USE COMPRESSED AIR TO CLEAN OUT THE POINT AREA. THEN, RUN A PIECE OF STIFF PAPER OR CARDBOARD THROUGH THE POINTS TO CLEAN THEM.

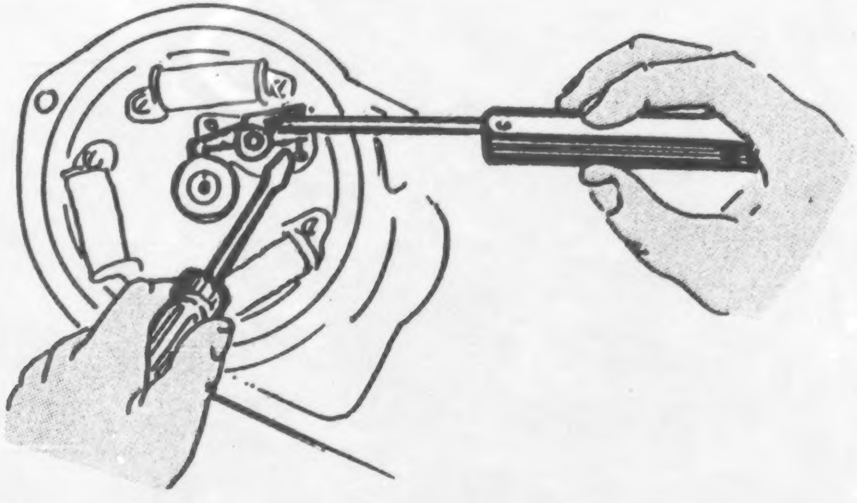
JOB STEPS

5. CHECK ALL WIRES TO SEE IF THEY ARE BROKEN OR CORRODED. REPAIR AS NEEDED.

6. ONCE YOU CLEAN THE POINT AREA, SLIDE THE FLYWHEEL BACK ON, BUT DO NOT REPLACE THE HOLDING NUT.

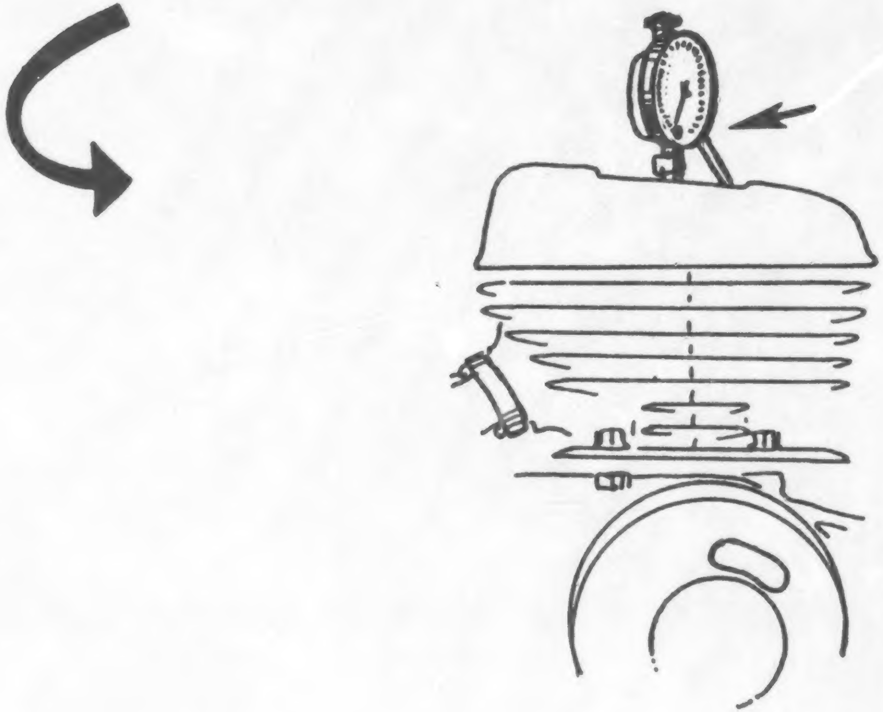
7. ROTATE THE FLYWHEEL SO THAT THE POINTS ARE AT THEIR WIDEST OPENING. WITH A SCREWDRIVER, SET THEM TO MANUFACTURER'S RECOMMENDED GAP.





JOB STEPS

8. REMOVE THE SPARK PLUG AND INSTALL THE DIAL INDICATOR. ROTATE THE FLYWHEEL UNTIL THE PISTON IS AT TOP DEAD CENTER. AT T.D.C. SET THE DIAL FACE TO ZERO.

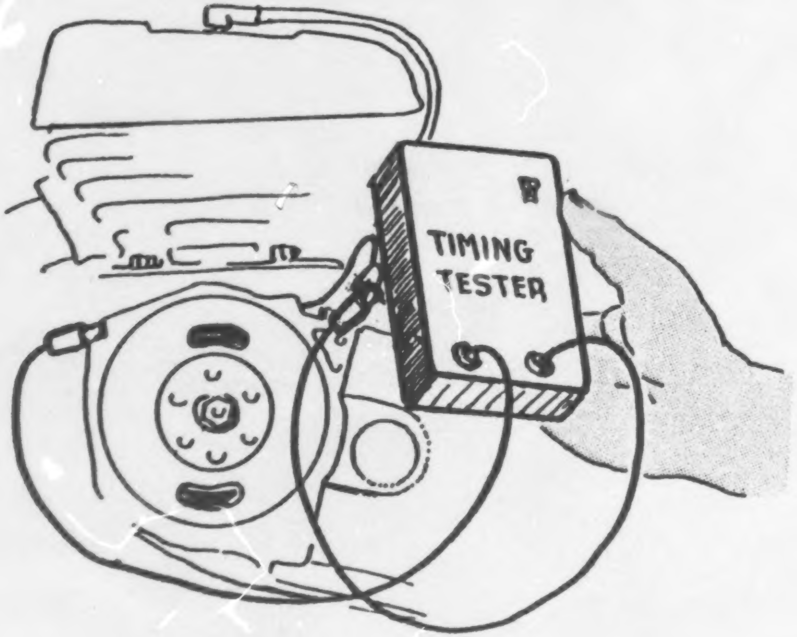


WORD GUIDE

"BUZZ BOX" - A DEVICE WHICH PRODUCES A SOUND TO AID IN TIMING.

JOB STEPS

9. ASK YOUR INSTRUCTOR FOR HELP WITH THIS STEP. HOOK ONE LEAD FROM THE "BUZZ BOX" TO A GROUND. HOOK THE OTHER LEAD TO THE COIL WIRE FROM THE MAGNETO. (YOU MAY HAVE TO REFER TO A WIRE CODE FOR YOUR BIKE.)

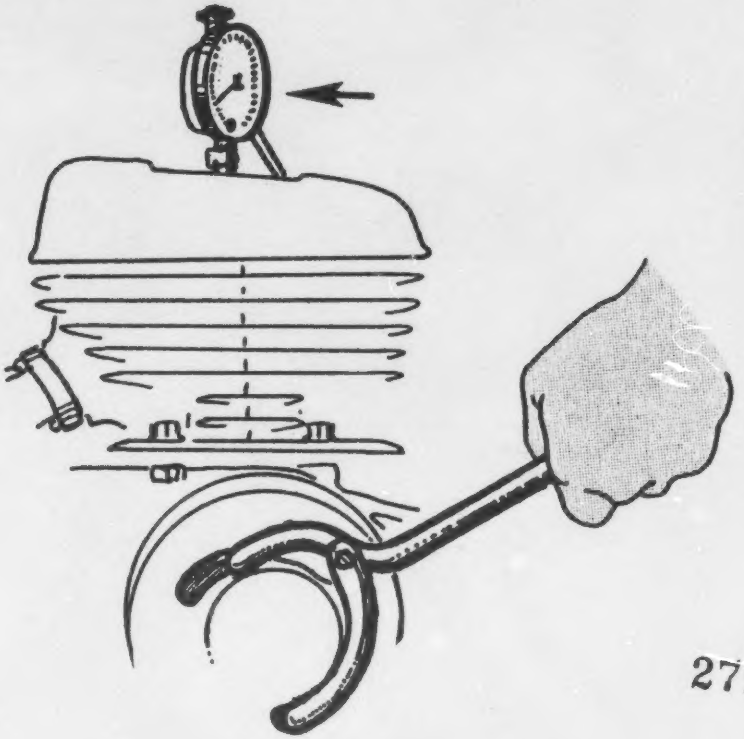


WORD GUIDE

B.T.D.C. - BEFORE TOP DEAD CENTER. THE POINT WHERE THE CYLINDER IS FIRED.

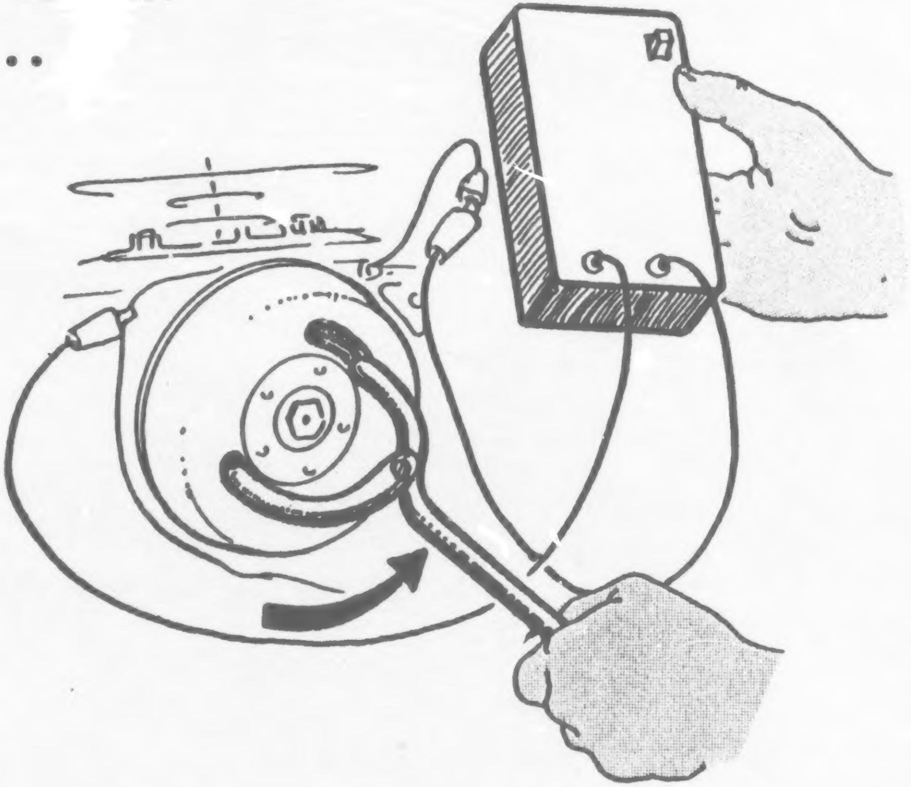
JOB STEPS

10. CHECK THE MANUAL THAT COVERS YOUR BIKE FOR THE TIMING SPECIFICATIONS. YOU SHOULD FIND A SPECIFICATION EITHER IN MILLIMETERS OR THOUSANDTHS BEFORE T.D.C. (B.T.D.C.). THEN, BACK OFF THE FLYWHEEL THAT DISTANCE BY USING THE DIAL INDICATOR. MAKE A NOTE OF THIS READING ON THE INDICATOR AND REMEMBER IT!!



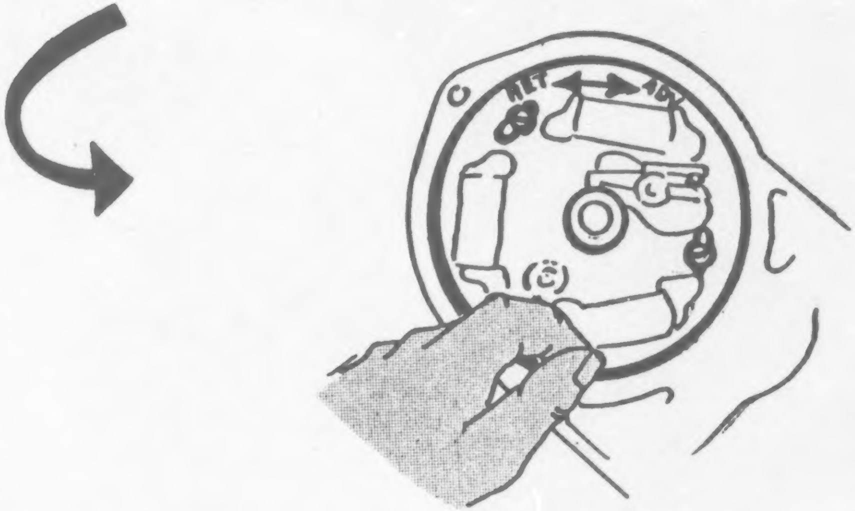
JOB STEPS

11. CONTINUE TO ROTATE THE FLYWHEEL DOWN APPROXIMATELY .015. NOW TURN ON THE "BUZZ BOX." START TO ROTATE THE FLYWHEEL BACK UP TO T.D.C., LISTENING TO THE TONE COMING FROM THE "BUZZ BOX." WHEN YOU REACH THAT POINT (THE READING ON THE INDICATOR), THE TONE SHOULD NOTICABLY CHANGE. IF IT DOES, TIMING IS SET CORRECTLY. IF NOT ....



JOB STEPS

12. IF THE BUZZ TONE CHANGES BEFORE OR AFTER B.T.D.C., LOOSEN THE THREE PHILLIPS SCREWS THAT HOLD THE BACKING PLATE AND MOVE THE PLATE IN THE DESIRED DIRECTION TO RETARD OR ADVANCE THE TIMING SPOT.



13. ONCE THE TIMING HAS BEEN SET TO THE RECOMMENDED SPECIFICATIONS, THE DIAL INDICATOR MUST BE REMOVED.

JOB STEPS

14. CLEAN AND GAP THE SPARK PLUG, OR REPLACE IT IF NEEDED.

15. TORQUE THE HOLDING NUT FOR THE FLYWHEEL.

16. HOOK WIRE BACK TO COIL AND CHECK FOR SPARK. YOU SHOULD BE READY TO START THE CYCLE.

small engine repair

unit: MOTORCYCLE

capital area career center

module: 7501 14 002 7 date: 4/73 level:

skill title: TIMING A SINGLE CYLINDER – POINTS ACCESSIBLE

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

± - PLUS OR MINUS.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO SET THE POINTS AND TIME THE ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

A SPARK PLUG WRENCH
PHILLIPS SCREWDRIVER
OIL PAN
IMPACT DRIVER
METRIC WRENCHES
BUZZ BOX
TIMING LIGHT
MANUFACTURER'S MANUAL

SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

YOU SET THE POINTS NOT MORE THAN ± .002 OFF THE MANUFACTURER'S SPECIFICATIONS, USING THE BUZZ BOX.

THE "HASH" MARKS ON THE ROTOR LINE UP AT AN IDLE, USING A TIMING LIGHT.

THE "HASH" MARKS ON THE ROTOR ALSO LINE UP AT 4,000 R.P.M.'S.

A TAPE OF THIS MODULE IS AVAILABLE

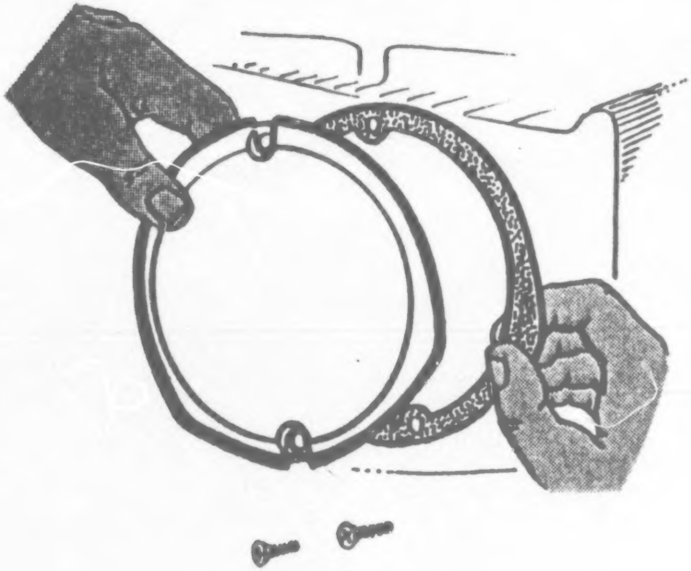
CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. CHECK TO MAKE CERTAIN THAT YOU HAVE A FULL CHARGE IN THE BATTERY. THIS IS A MUST IN BATTERY IGNITION SYSTEM.

2. REMOVE THE SPARK PLUG.

3. REMOVE THE PHILLIPS SCREWS. PULL THE COVER (LEFT SIDE) AND GASKET OFF AND SET ASIDE.

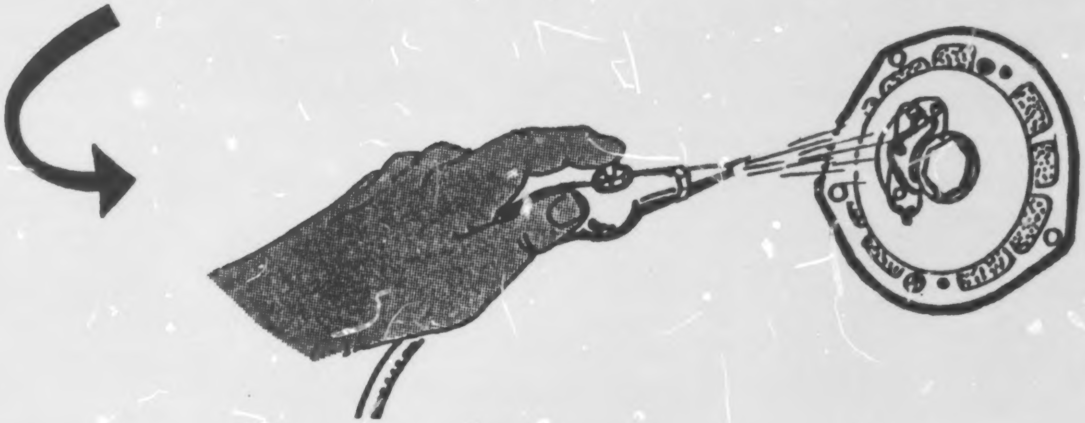


WORD GUIDE

PITTED - HOLLOWED OUT OR A SURFACE HAVING HOLES.

JOB STEPS

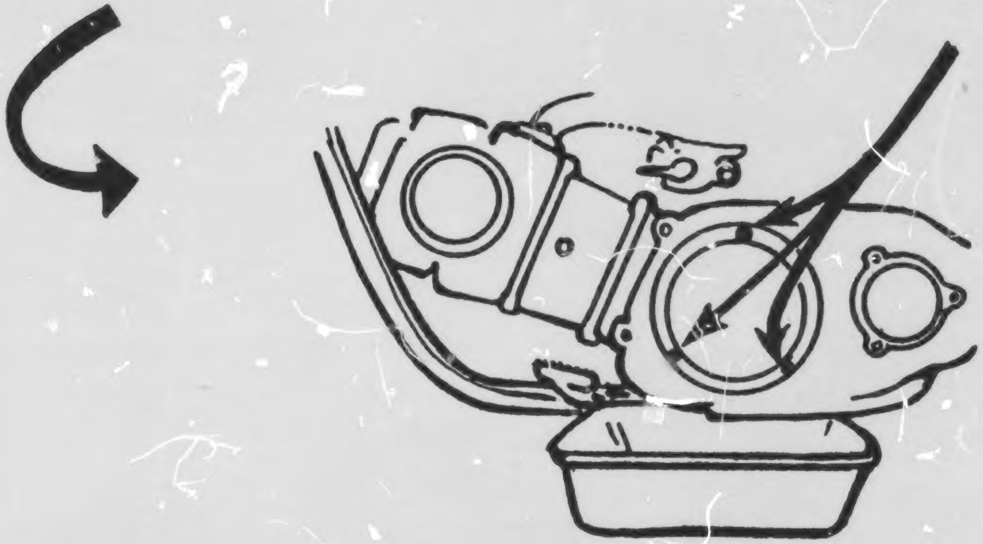
4. CLEAN THE POINT AREA WITH COMPRESSED AIR. PULL A PIECE OF PAPER THROUGH THE POINTS TO CLEAN OFF OIL, DIRT, OR GRIT. DO NOT FILE THE POINTS.



5. IF POINTS ARE PITTED OR BURNED, REPLACE THEM. IF IN GOOD CONDITION, RESET THEM TO SPECIFICATIONS GIVEN IN THE MANUAL.

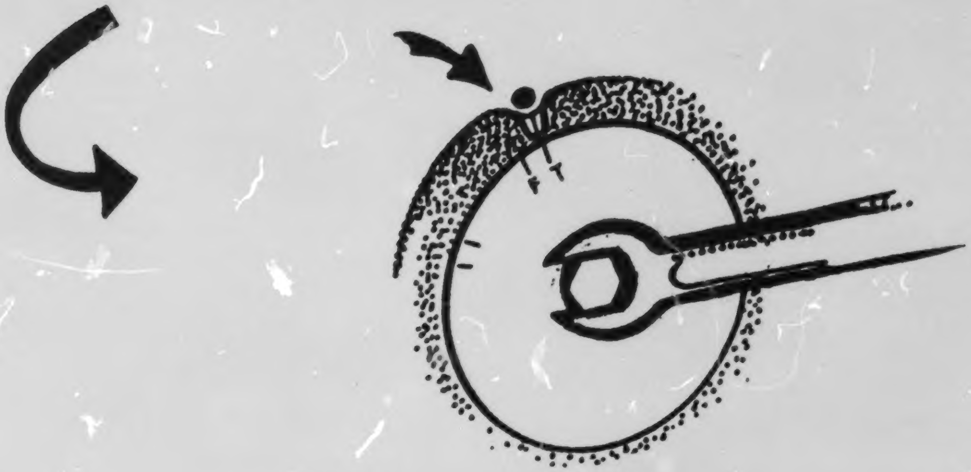
JOB STEPS

6. STILL WORKING ON THE LEFT SIDE, REMOVE THE ALTERNATOR COVER. WHEN THIS COVER IS REMOVED, A SMALL AMOUNT OF OIL WILL DRAIN OUT. BE SURE TO USE A PAN OR SOME CONTAINER TO CATCH THE OIL. THE EXPOSED PARTS ARE THE STATOR AND ROTOR.



JOB STEPS

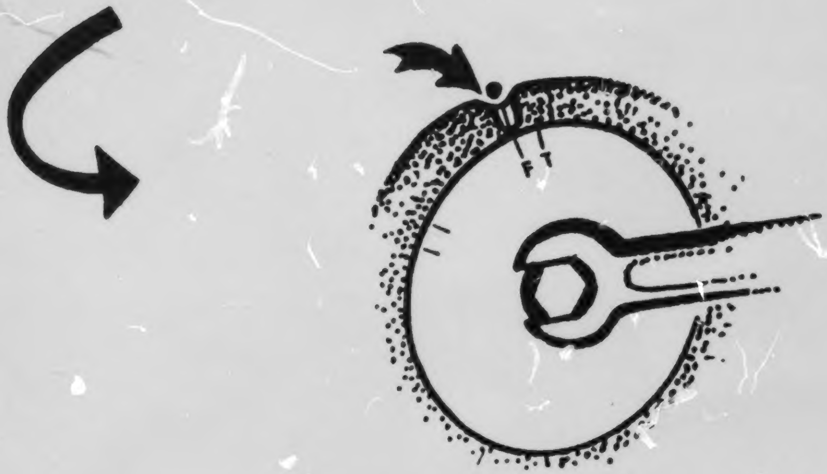
7. ROTATE THE ROTOR WITH A WRENCH SO THAT LINE "T" LINES UP WITH INDICATOR SHOWN IN THE PICTURE BELOW: THIS MUST BE DONE ON THE COMPRESSION STROKE.



8. CONNECT THE LEADS OF THE BUZZ BOX TO THE IGNITION WIRES AT THE DISCONNECT.

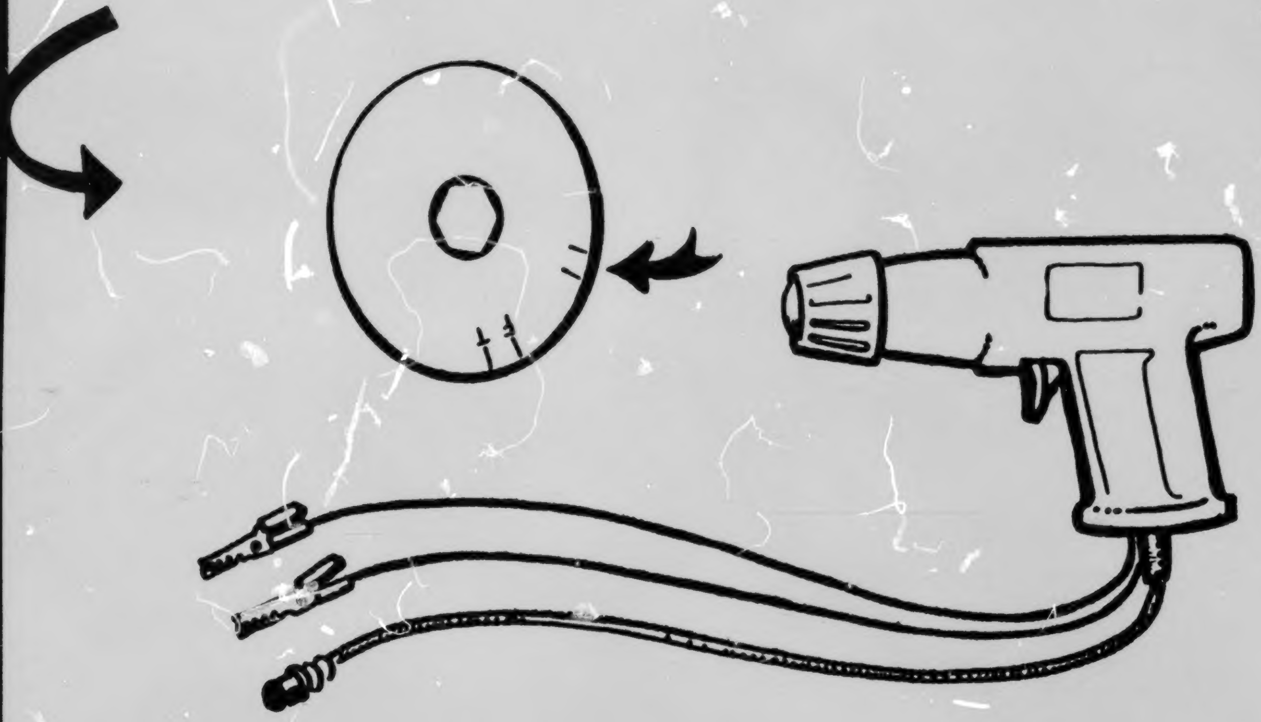
JOB STEPS

. ROLL THE ENGINE OVER WITH A WRENCH. AS THE POINTS OPEN THE BUZZ TONE SHOULD CHANGE WHEN THE (FIRE) LINE "F" IS IN LINE WITH THE INDICATOR. (IF IT DOESN'T READ STEP #14)



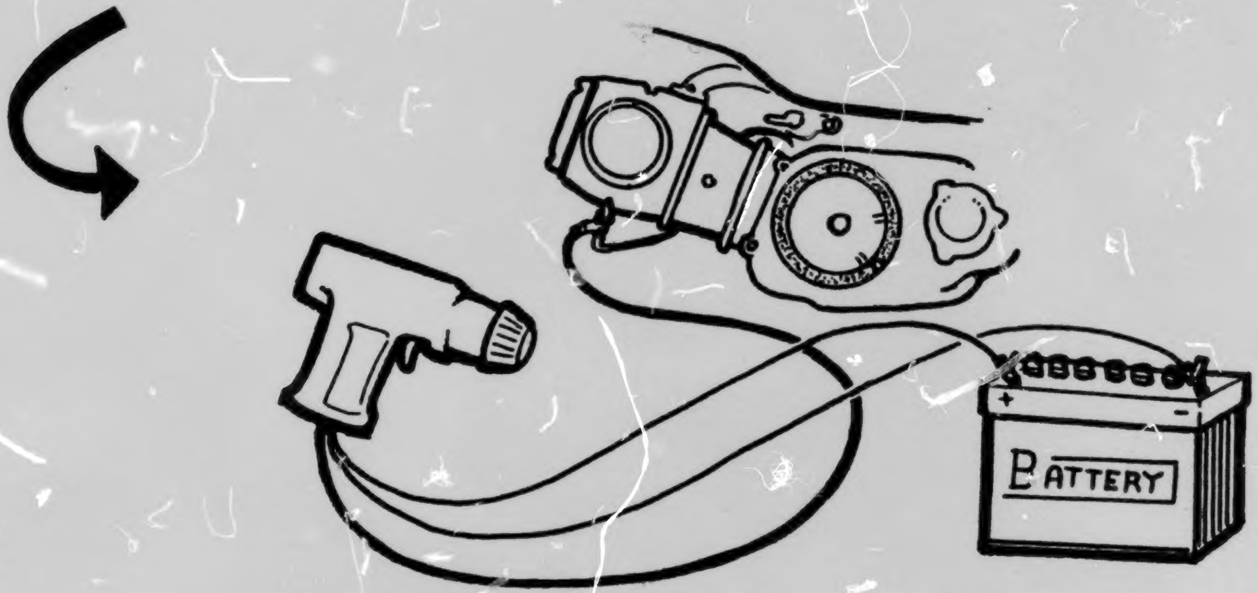
JOB STEPS

0. THERE ARE TWO OTHER MARKS ON THE ROTOR WHICH ARE USED TO CHECK ADVANCE TIMING. TO DO THIS WE NEED A STROKE-TYPE TIMING LIGHT.



JOB STEPS

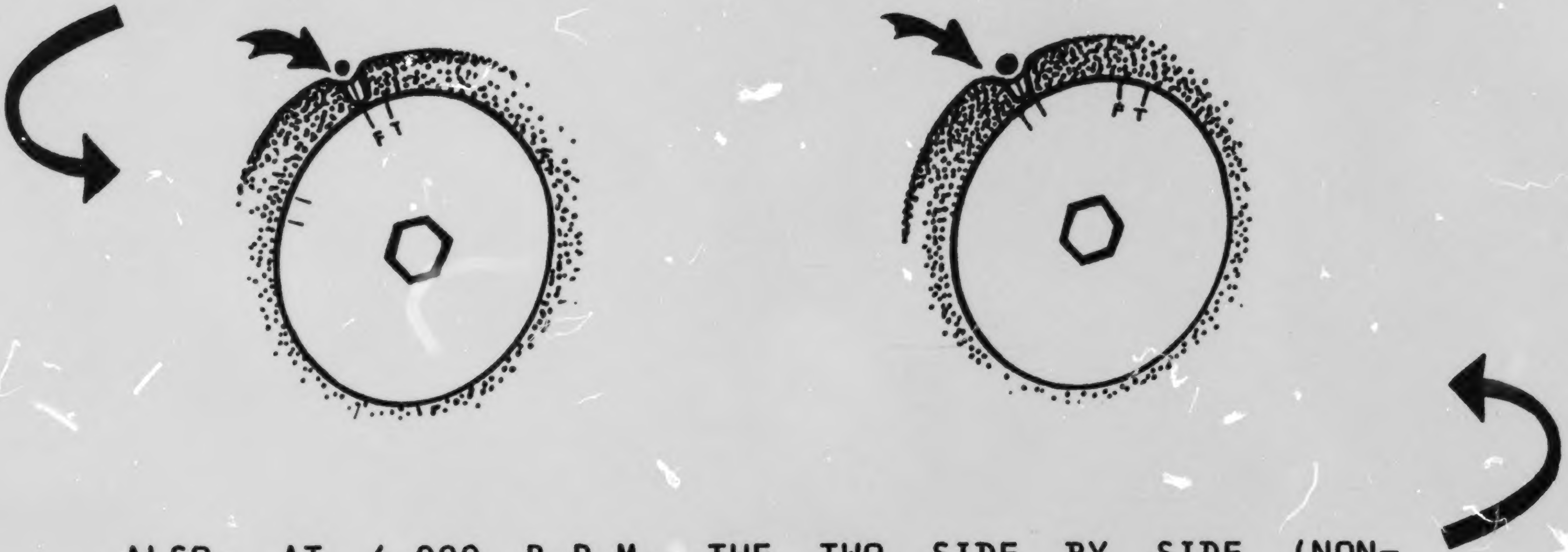
11. REPLACE THE SPARK PLUG AND ATTACH THE TIMING LIGHT LEAD TO THE SPARK PLUG WIRE. ALSO, CONNECT THE OTHER LEADS OF THE TIMING LIGHT TO A BATTERY. (YOU CAN USE THE BATTERY ON YOUR BIKE IF IT IS CHARGED!)



12. NOW, WITH THE TIMING LIGHT ATTACHED AND COVER PLATE OFF, START THE BIKE.

JOB STEPS

13. PRESS THE TRIGGER OF THE TIMING LIGHT AND NOTE THE POSITIONS OF THE TIMING MARKS ON THE ROTOR. AT AN IDLE, THE "F" SHOULD LINE UP WITH THE STATIONARY POINTER.



ALSO, AT 4,000 R.P.M. THE TWO SIDE BY SIDE (NON-MARKED) LINES ON THE ROTOR SHOULD LINE UP WITH THE STATIONARY POINTER.

IF THESE CONDITIONS ARE MET, THEN THE BIKE IS TIMED. IF NOT . . . .

JOB STEPS

WORD GUIDE

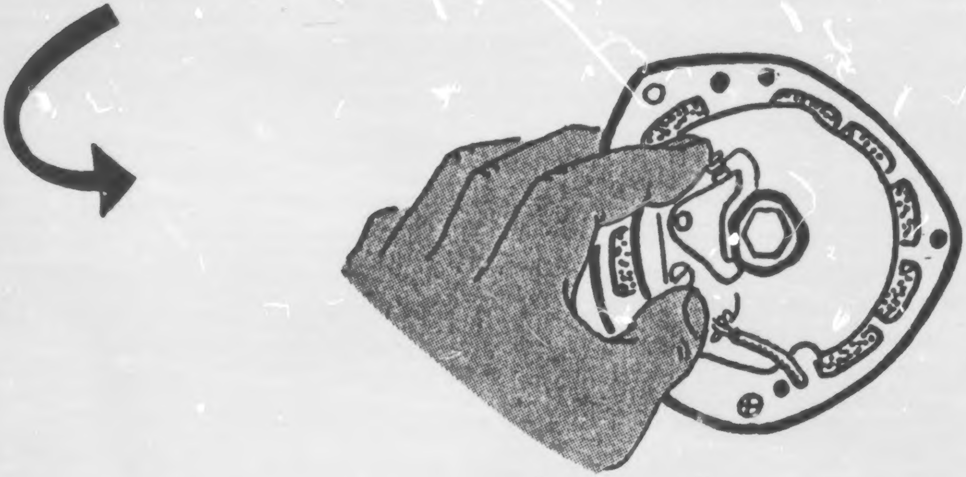
CLOCKWISE - IN THE SAME DIRECTION AS HANDS MOVING ON A CLOCK, OR TO THE RIGHT.

COUNTER-CLOCKWISE - IN THE OPPOSITE DIRECTION AS HANDS MOVING ON A CLOCK, OR TO THE LEFT.

TURN PAGE →

JOB STEPS

4. LOOSEN THE RETAINING SCREWS ON THE POINT BACKING PLATE AND ROTATE THE PLATE EITHER CLOCKWISE OR COUNTER-CLOCKWISE TO BRING THE TIMING IN SO THAT THE TIMING MARKS LINE UP.



5. REPLACE COVERS WITH GASKETS AND REPLACE TOOLS AND EQUIPMENT.

small engine repair

unit: MOTORCYCLE

capital area career center

module: 7501 14 003 7 **date:** 4/73 **level:**

skill title: TIMING A TWO CYLINDER WITH SINGLE POINTS (POINTS ACCESSIBLE)

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

SPECIFICATIONS - DETAILED PLANS OR REQUIRED LIMITS

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

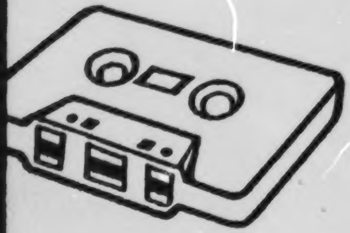
HOW TO ADJUST THE POINTS AND TIME THAT PARTICULAR ENGINE ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

AND IN ORDER TO DO THIS YOU WILL NEED:

- METRIC WRENCH
- HAMMER
- TIMING LIGHT
- FEELER GAUGE
- SMALL SCREWDRIVER
- IMPACT DRIVER
- DIAL INDICATOR
- BUZZ BOX
- PHILLIPS SCREWDRIVER
- MANUFACTURER'S MANUAL
- SAFETY GLASSES
- 2-CYLINDER, SINGLE POINT MOTORCYCLE ENGINE

WE WILL KNOW YOU CAN DO IT WHEN:

1. YOU HAVE SET THE POINTS TO WITHIN ± .002 OF MANUFACTURER'S SPECIFICATIONS BY USING THE BUZZ BOX AND DIAL INDICATOR.
2. USING THE TIMING LIGHT, YOU HAVE LINED UP THE "HASH" MARKS ON THE ROTOR LINE, WITH THE ENGINE RUNNING ON IDLE.
3. ALSO USING A TIMING LIGHT, YOU HAVE LINED UP THE "HASH" MARKS WITH THE ENGINE RUNNING AT 4,000 R.P.M.



A TAPE OF THIS MODULE IS AVAILABLE

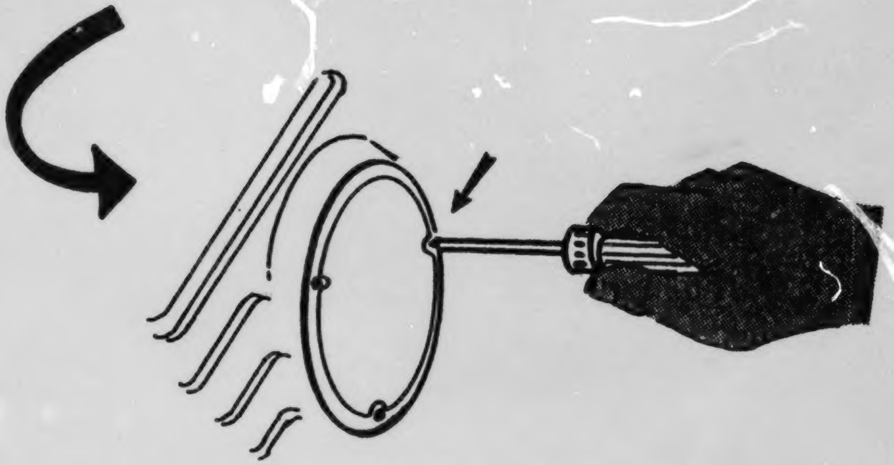
INFORMATION

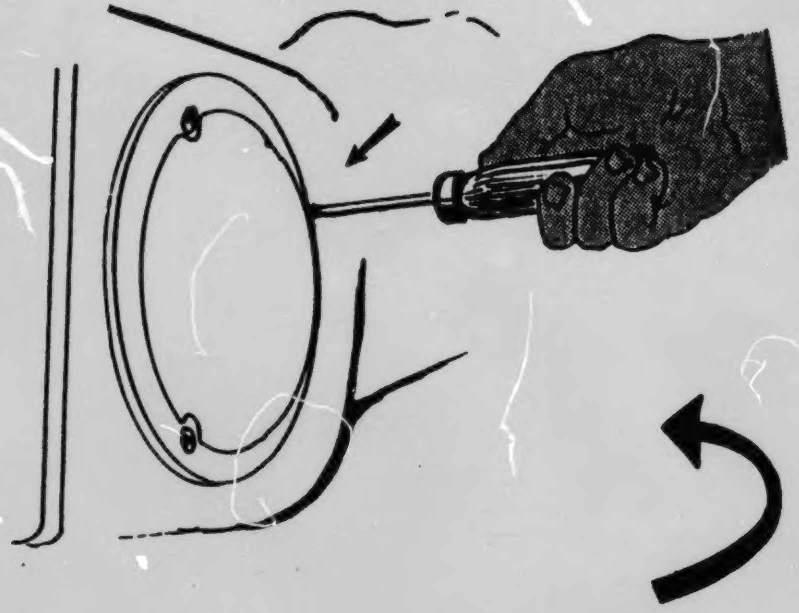
CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

1. REMOVE THE SPARK PLUGS.

2. REMOVE THE CONTACT COVER PLATE.





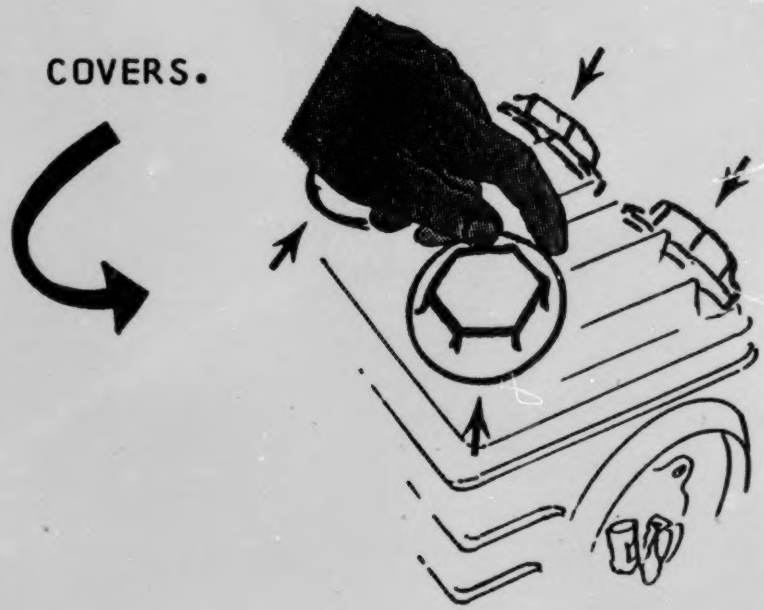
3. THEN, REMOVE THE SCREWS THAT SECURE THE ALTERNATOR COVER, REMOVE THE COVER PLATE.

JOB STEPS

4. CLEAN THE POINTS BY BLOWING COMPRESSED AIR OVER THE AREA. THEN, TAKE A PIECE OF STIFF PAPER AND PLACE IT BETWEEN THE POINTS. PULL IT IN AND OUT A FEW TIMES. DO NOT FILE THE POINTS.

5. IF THEY ARE NOT BURNT OR PITTED, RESET THE POINTS TO FACTORY SPECIFICATIONS. IF THEY ARE, REPLACE WITH A NEW SET AND A NEW CONDENSOR.

6. REMOVE ALL FOUR ROCKER ARM COVERS.

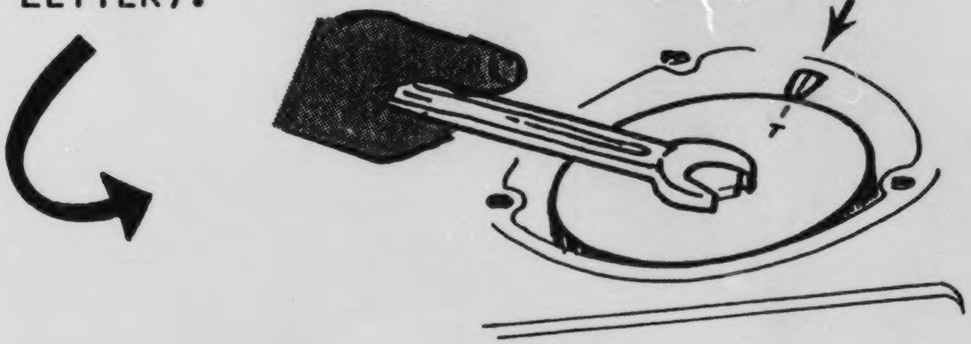


WORD GUIDE

T.D.C. - TOP DEAD CENTER.
WHEN PISTON IS FLUSH WITH
TOP OF BLOCK.

JOB STEPS

7. ROTATE THE ROTOR WITH A WRENCH UNTIL THE LEFT INTAKE VALVE OPENS. KEEP ROTATING UNTIL THE "T" ALIGNS WITH THE STATIONARY MARK AS SHOWN (SOME ROTORS HAVE MARKS WITHOUT A LETTER).

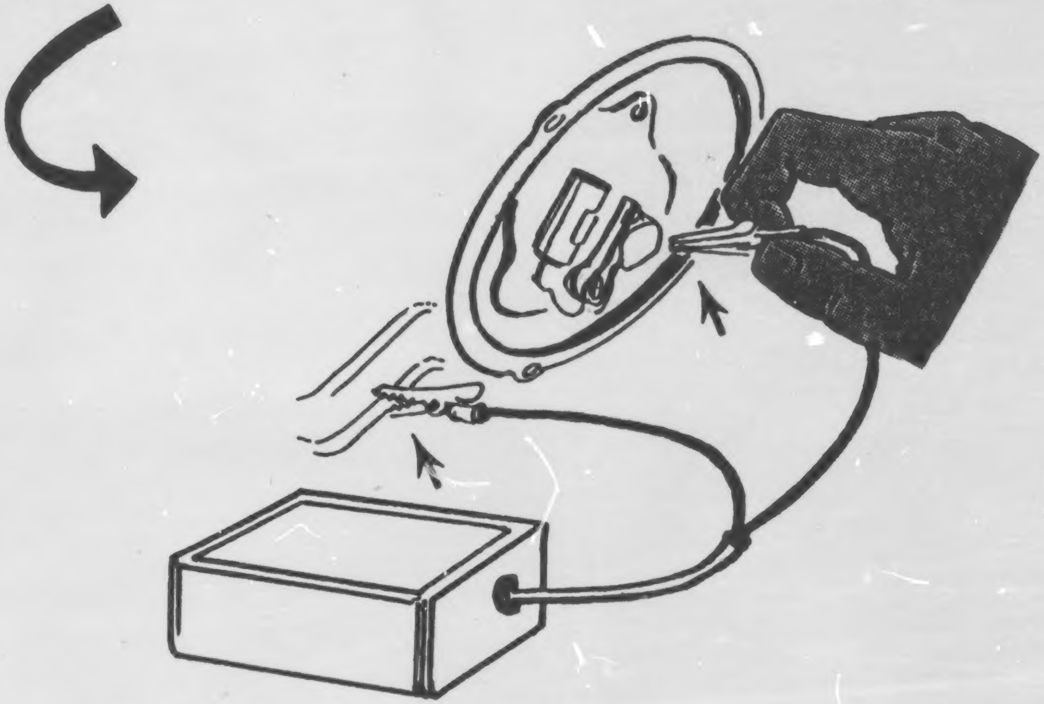


8. WITH THE ENGINE AT T.D.C. ON THE COMPRESSION STROKE FOR THE LEFT CYLINDER, ADJUST BOTH EXHAUST AND INTAKE VALVE ON THIS SIDE. CHECK THE MANUAL FOR PROPER VALVE CLEARANCE.

JOB STEPS

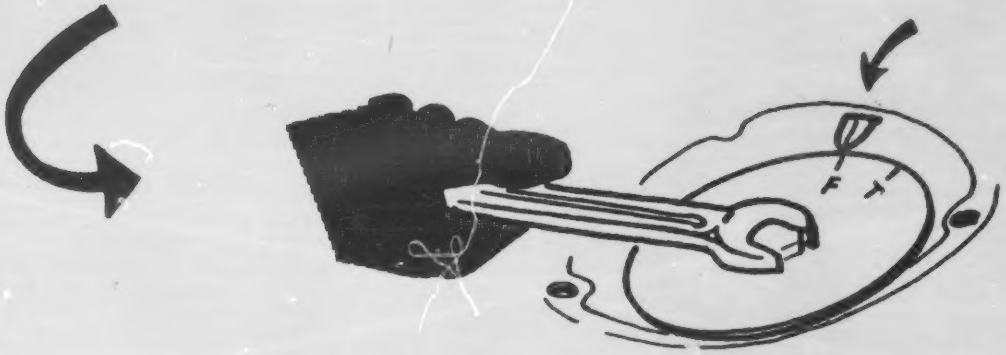
9. YOU CAN USE EITHER A BUZZ BOX OR A TIMING LIGHT. HAVE THEM READY.

10. WE WILL USE THE BUZZ BOX FIRST AND CONNECT ONE LEAD TO THE GROUND AND ONE TO THE CONTACT TERMINAL.



JOB STEPS

11. ROTATE THE ENGINE FORWARD. WHEN THE "F" (IF YOUR ROTOR HAS A BETTER MARKING) AND THE STATIONARY INDICATOR LINE UP, THERE SHOULD BE A CHANGE IN BUZZER SOUND FROM THE BUZZ BOX. IF THERE IS, THE TIMING IS RIGHT. IF NOT . . .



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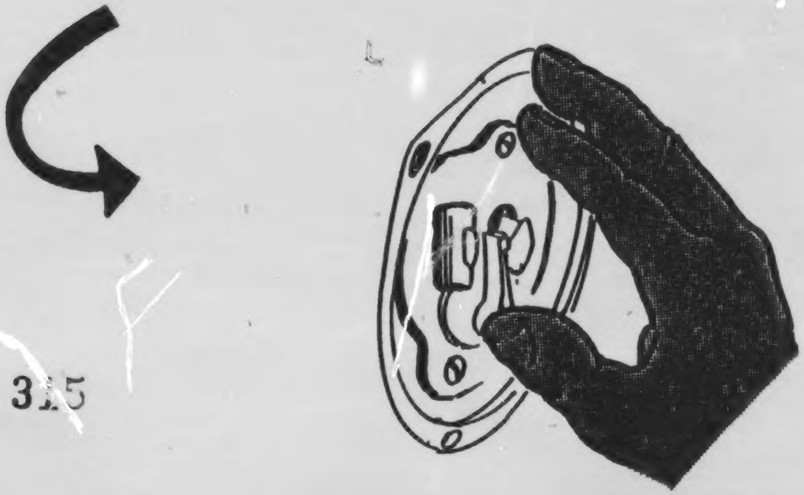
WORD GUIDE

CLOCKWISE - IN THE SAME DIRECTION AS HANDS MOVING ON A CLOCK, OR TO THE RIGHT.

COUNTER-CLOCKWISE - IN THE OPPOSITE DIRECTION AS HANDS MOVING ON A CLOCK, OR TO THE LEFT.

JOB STEPS

12. LOOSEN THE CONTACT BREAKER-POINT PLATE SCREWS AND ROTATE EITHER CLOCKWISE OR COUNTER-CLOCKWISE TO TIME ENGINE, MARKS AND BUZZER. RE-TIGHTEN SCREWS AND TRY AGAIN.



JOB STEPS

13. YOU MAY HAVE TO TRY STEP 12 A COUPLE OF TIMES BEFORE YOUR TIMING IS CORRECT. ONCE TIMED PROPERLY BOTH CYLINDERS ARE TIMED!

14. NOW CONNECT THE SNAP RING FROM THE TIMING LIGHT TO THE LEFT SPARK PLUG LEAD WIRE.

15. NEXT, ATTACH THE LEADS FROM THE TIMING LIGHT TO A BATTERY SOURCE.

16. START THE ENGINE, POINT THE TIMING LIGHT AT THE ROTOR AND PULL THE TRIGGER. IF THE "F" DOES NOT ALIGN WITH THE STATIONARY INDICATOR, LOOSEN THE SCREWS ON THE CONTACT POINT PLATE AND ROTATE EITHER COUNTER-CLOCKWISE OR CLOCKWISE UNTIL THE TIMING MARK ALIGNS CORRECTLY WITH THE STATIONARY INDICATOR.

TURN PAGE →

JOB STEPS

17. RUN UP THE R.P.M.'S UNTIL THE TWO (UNMARKED) MARKS ALIGN WITH THE STATIONARY INDICATOR. AGAIN, ONCE THIS PROCEDURE IS COMPLETED, BOTH CYLINDERS ARE TIMED.

NOTE: WHEN USING THIS PROCEDURE, BE PREPARED FOR OIL SPRAYING AROUND.

small engine repair

unit: ENGINE BLOCK MACHINING

capital area career center

module: 7501 16 002 7 date: 5/77 level:

skill title: DRILLING, REMOVING AND TAPPING BROKEN STUDS

developed & written by: JIM PITTS AND DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

STUD - A BOLT WHICH DOES NOT HAVE A HEAD ON IT.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE A BROKEN STUD AND THEN RE-TAP THE HOLE.

AND IN ORDER TO DO THIS YOU WILL NEED:

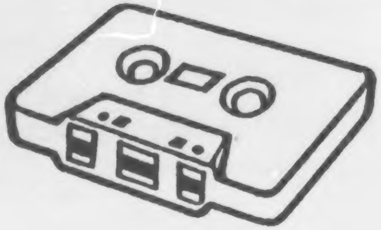
A PART WITH THE STUD BROKEN OFF AT OR BELOW THE SURFACE

DRILL MOTOR
DRILL INDEX
EASY OUT SET
TAP AND DIE SET

HAND TOOLS
THREAD GUAGE
TAP DRILL SIZE CHART
SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE REMOVED THE BROKEN STUD AND CLEANED THE THREADS SO THEY CAN ACCEPT A NEW BOLT.

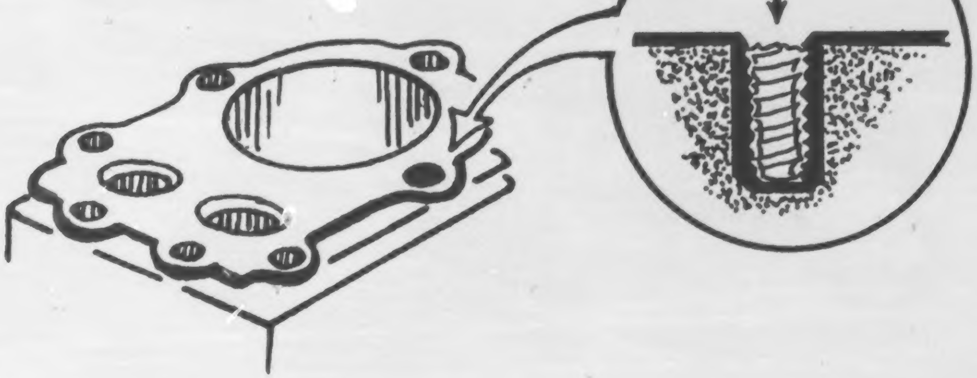


A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. **WEAR YOUR SAFETY GLASSES.**

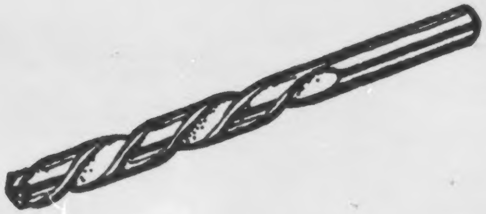
INFORMATION

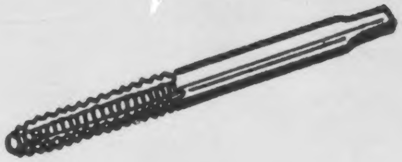
THERE ARE SEVERAL WAYS TO REMOVE BROKEN STUDS FROM AN ENGINE PART. SOME OF THEM ARE; TAP OUT WITH A PUNCH; USE A STUD EXTRACTOR; CUT OUT WITH A TORCH; DRILL AND TAP. IN THIS MODULE, YOU WILL LEARN HOW TO DRILL AND TAP OUT A BROKEN STUD. THE DRILL AND TAP METHOD IS USED IF THE STUD IS BROKEN OFF EVEN WITH OR BELOW THE SURFACE OF THE PART.

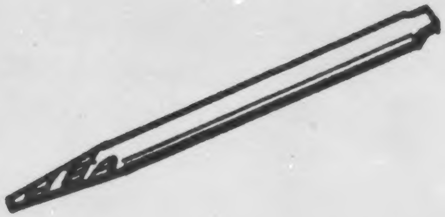


INFORMATION

WHEN YOU DRILL THE HOLE, YOU MUST BE SURE TO CHOOSE THE CORRECT DRILL SIZE FOR BOTH THE EASY - OUT SET AND THE TAP. CHARTS ARE AVAILABLE FOR QUICK REFERENCE. YOUR INSTRUCTOR WILL HELP YOU FIND ONE.





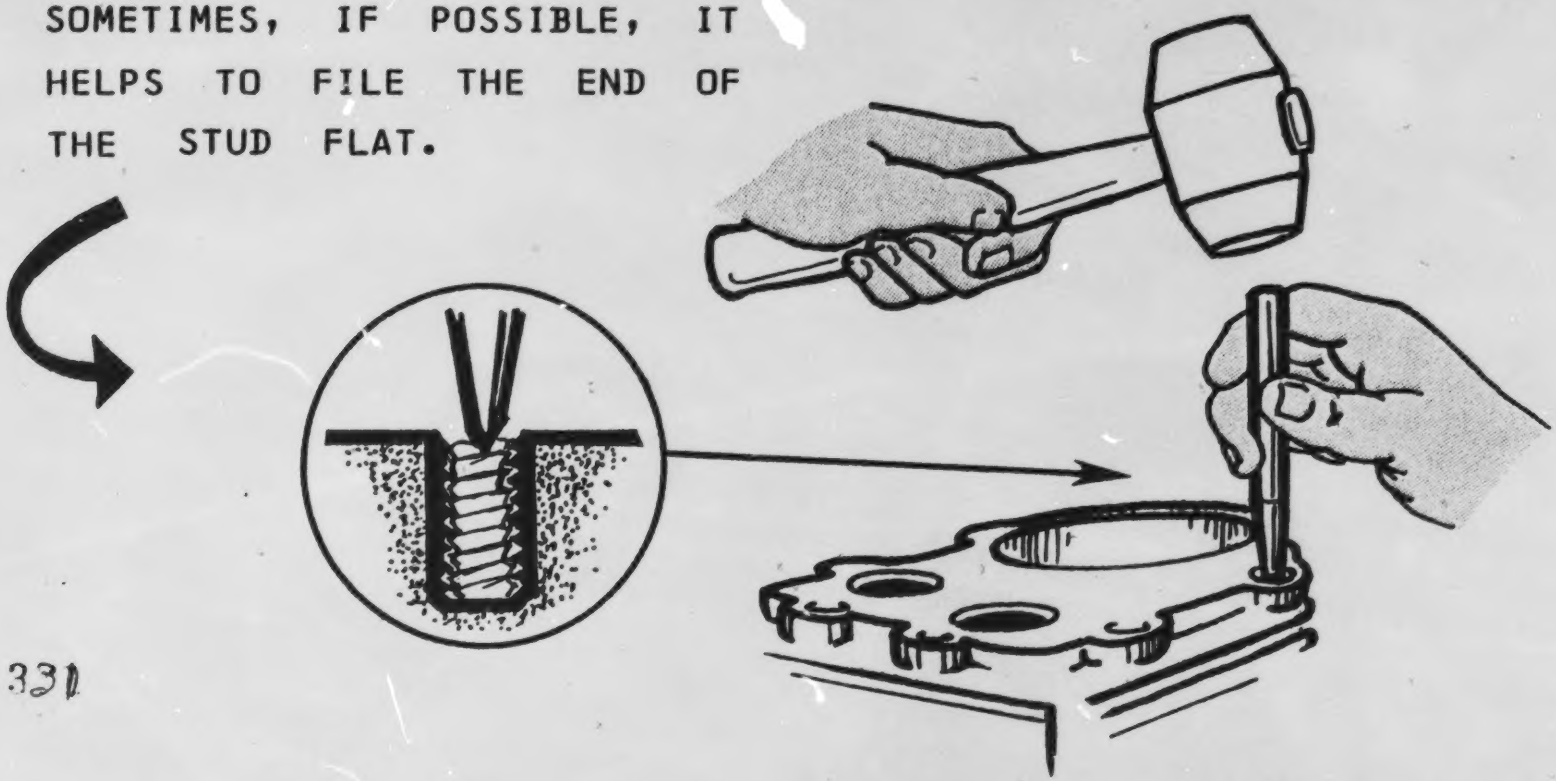


JOB STEPS

1. LOOK AT THE PART FROM WHICH YOU HAVE TO REMOVE THE BROKEN STUD. TRY TO DETERMINE THE DEPTH OF THE STUD.

2. MEASURE THE WIDTH OF THE BROKEN STUD.

3. USING CENTER PUNCH, CENTER PUNCH THE END OF THE STUD. SOMETIMES, IF POSSIBLE, IT HELPS TO FILE THE END OF THE STUD FLAT.

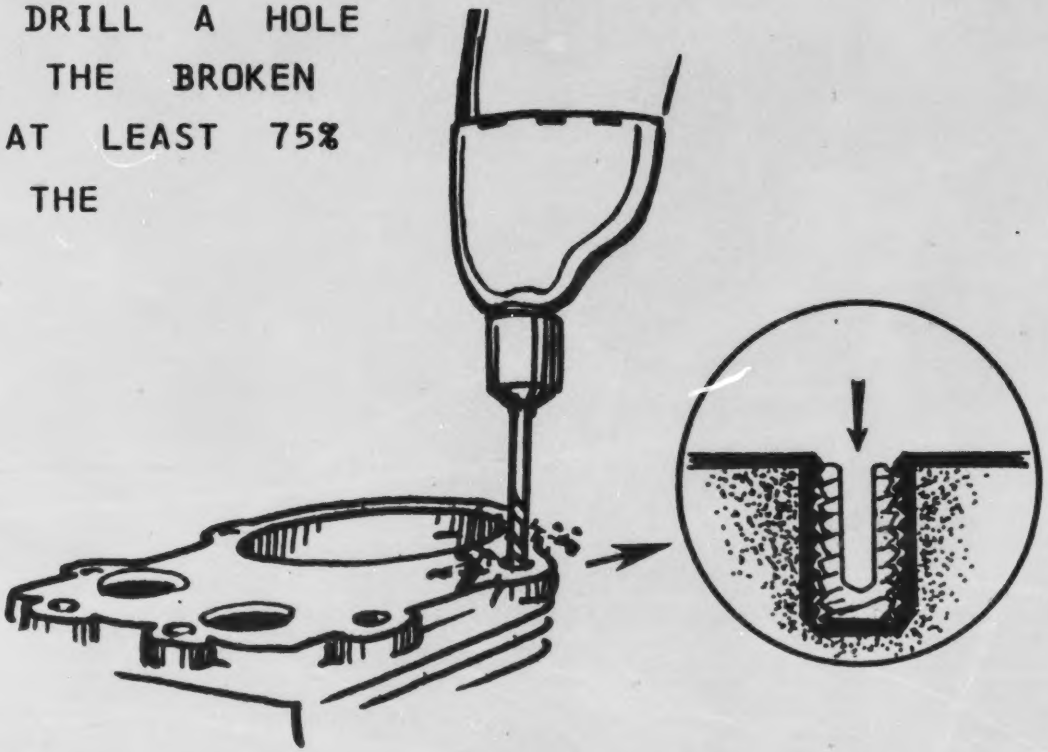


JOB STEPS

4. ACCORDING TO THE SIZE OF THE STUD YOU MUST REMOVE, FIND WHAT SIZE EASY-OUT YOU NEED.

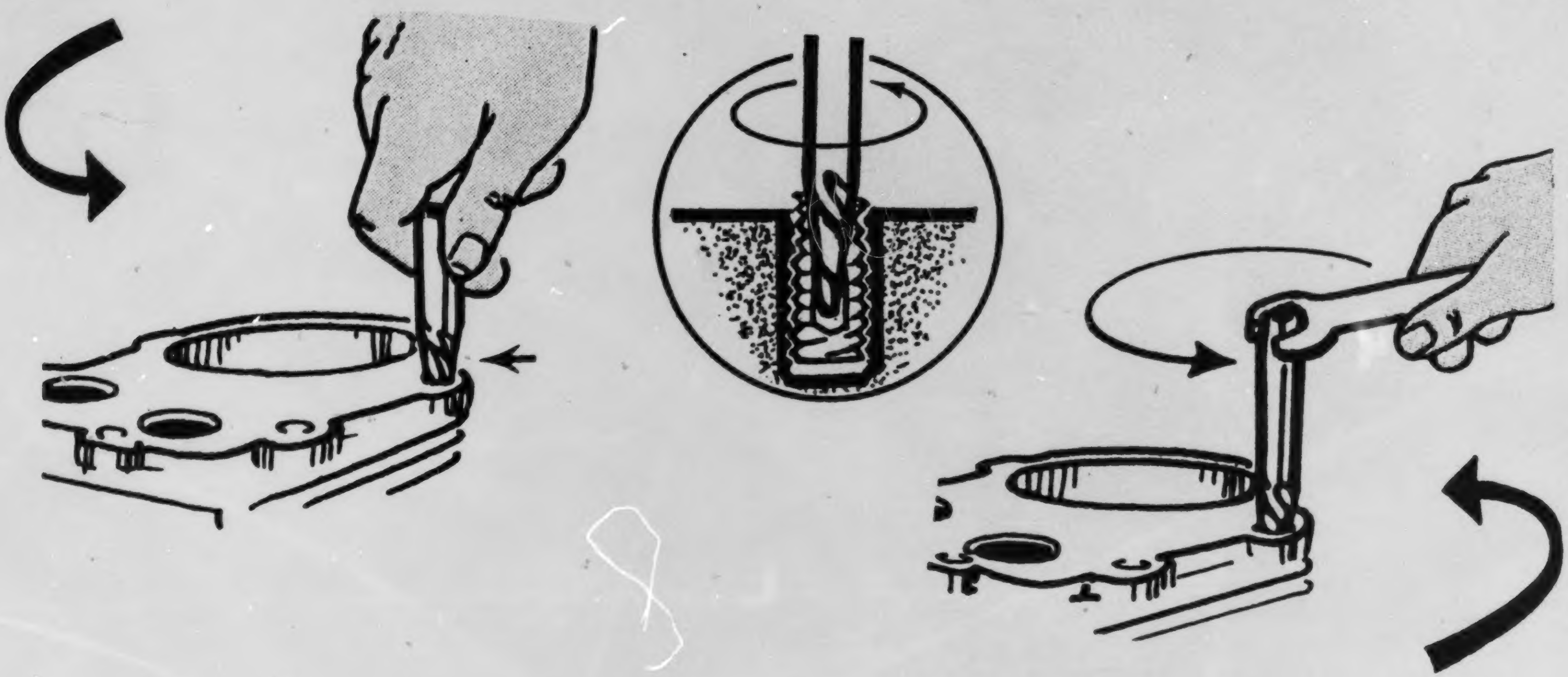
5. SELECT THE PROPER SIZE DRILL BIT FOR THE EASY OUT YOU HAVE TO USE. (CHECK THE RIGHT CHART FOR THESE SIZES.)

6. USING DRILL SET, DRILL A HOLE IN THE CENTER OF THE BROKEN STUD. DRILL TO AT LEAST 75% OF THE DEPTH OF THE BROKEN STUD.



JOB STEPS

7. TURN THE EASY OUT INTO THE HOLE YOU HAVE JUST DRILLED. MAKE SURE THAT THE EASY OUT HAS LEFT - HAND THREADS. AS YOU TURN THE EASY OUT INWARD, IT TIGHTENS IN THE HOLE. IT WILL TWIST OUT THE BROKEN STUD.



8. SOME EASY OUTS ARE TAPERED. IF YOURS IS TAPERED, TAP IT INTO THE HOLE. USING VICE GRIPS OR A WRENCH, TWIST OUT THE BROKEN STUD. **TURN PAGE →**

JOB STEPS

9. USING A THREAD GAUGE, FIND OUT WHAT SIZE THREADS ARE IN THE HOLE.

10. SELECT THE PROPER TAP AND TAP THE THREADS OUT SO THEY WILL BE SMOOTH.

11. PUT THE BOLT IN THE REFINISHED HOLE TO BE SURE IT FITS PROPERLY.

12. HAVE YOUR INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: ENGINE BLOCK MACHINING AND TOOLS

capital area career center

module: 7501 16 003 7 date: 5/77 level:

skill title: CYLINDER HONES--HOW TO IDENTIFY THEM AND HOW THEY ARE ASSEMBLED

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

1. HOW TO IDENTIFY AN AN AND JN HONE
2. WHAT EACH HONE DOES
3. WHAT ARE DIFFERENT GRIT STONES
4. HOW TO ASSEMBLE THE HONE

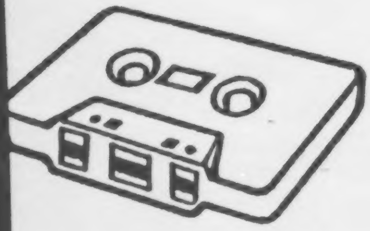
IN ORDER TO DO THIS YOU WILL NEED:

AN & JN HONES
HONE STONE SETS
MANUFACTURER INSTRUCTIONS

SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

1. YOU CAN TELL THE DIFFERENCE BETWEEN AN AN AND JN HONE.
2. YOU UNDERSTAND WHAT EACH ONE DOES.
3. YOU LEARN WHAT THE DIFFERENT GRIT STONES ARE.
4. YOU CAN ASSEMBLE THE HONES.



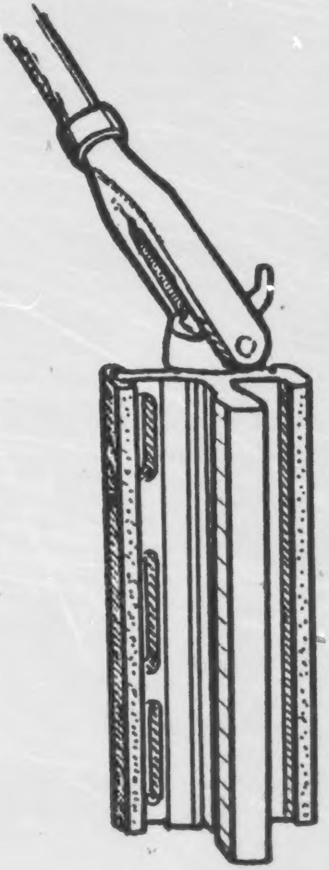
A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

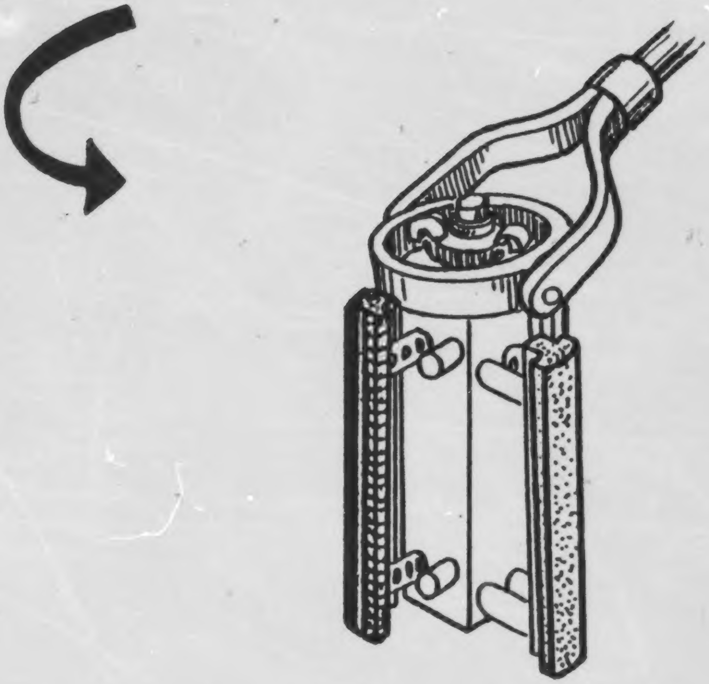
INFORMATION

WE USE TWO DIFFERENT KINDS OF HONE ASSEMBLIES. ONE IS MODEL JN, SHOWN BELOW.



INFORMATION

THE OTHER ONE IS A MODEL AN HONE.



THE DIFFERENCE BETWEEN THE TWO HONES IS IN THE DIAMETER OF EACH ONE. THE AN HONE IS USED FOR SMALLER CYLINDERS. AS YOU WILL SEE THEY ALSO ASSEMBLE DIFFERENTLY.

WORD GUIDE

ADDITIONAL - EXTRA

LUBRICANTS - SOMETHING WHICH CUTS DOWN ON FRICTION, LIKE GREASE.

INFORMATION

THERE ARE TWO KINDS OF HONE STONES. WET STONES REQUIRE AN ADDITIONAL LUBRICANT USED WITH THEM. THE STONE MANUFACTURER WILL TELL YOU WHICH LUBRICANT TO USE (OIL AND KEROSENE ARE TWO COMMON LUBRICANTS).

THERE ARE THREE TYPES OF STONES WHICH ARE GROUPED ACCORDING TO THEIR GRIT. GRIT IS THE COARSENESS OR FINENESS OF THE STONE ABRASIVE. COARSE GRIT STONES ARE USED FOR CAST IRON OR STEEL CYLINDER WALLS. FINE GRIT STONES CAN ALSO BE USED FOR CAST IRON OR STEEL CYLINDER WALLS TO PROVIDE A SMOOTH FINISH. VERY FINE STONES MUST BE USED ON

INFORMATION

ALUMINUM. A LUBRICANT IS ALWAYS USED WHEN HONING ALUMINUM CYLINDER WALLS.

IF YOU ARE USING THE MODEL JN HONE, USE:

JN 100 - COARSE STONES
JN 200 - FINE STONES
JN 300 - VERY FINE STONES

IF YOU ARE USING THE MODEL AN HONE, USE:

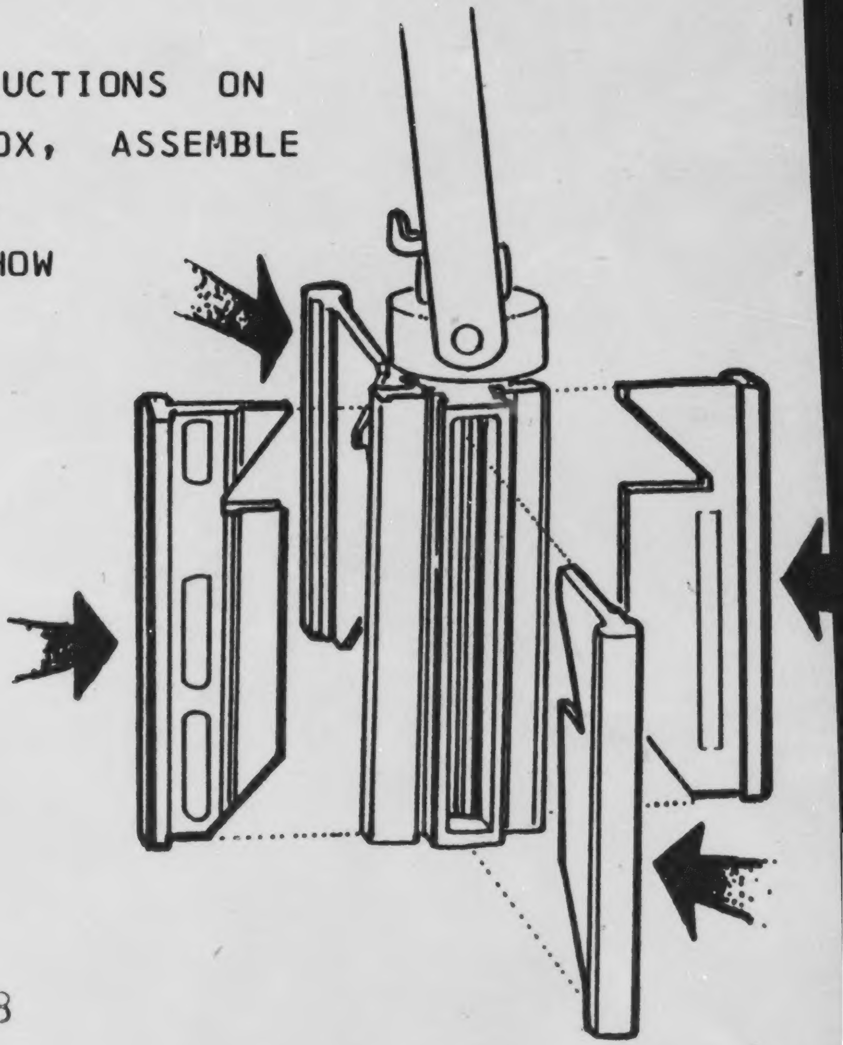
AN 100 - COARSE STONES
AN 200 - FINE STONES
AN 500 - VERY FINE STONES

IF YOU DO NOT KNOW THE KIND OF METAL OF WHICH THE CYLINDER WALL IS MADE, CHECK WITH YOUR INSTRUCTOR.

JOB STEPS

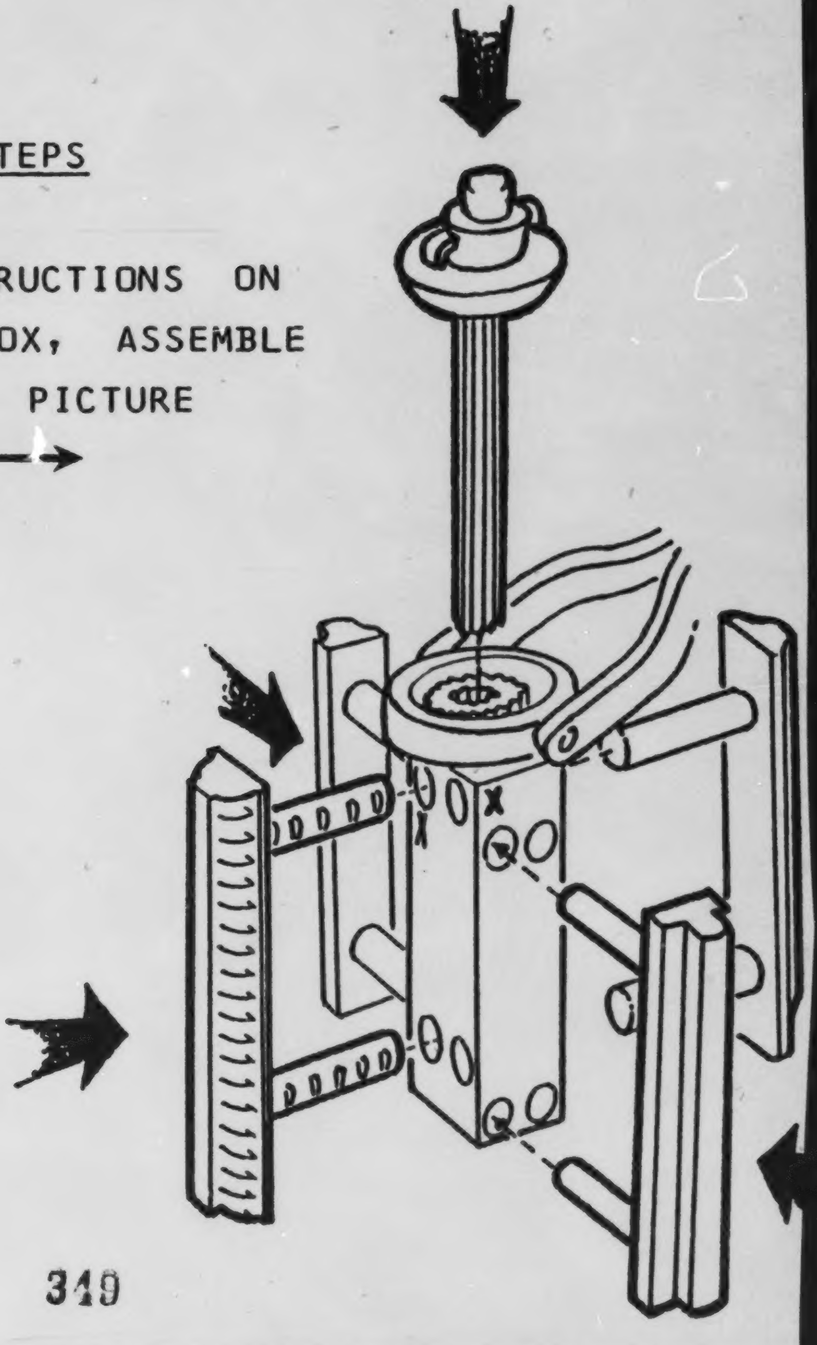
1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

2. FOLLOWING THE INSTRUCTIONS ON THE TOP OF THE BOX, ASSEMBLE THE MODEL JN HONE.
THE PICTURE WILL SHOW
HOW THE STONES
FIT IN. →



JOB STEPS

3. FOLLOWING THE INSTRUCTIONS ON THE TOP OF THE BOX, ASSEMBLE THE AN HONE. THE PICTURE WILL HELP YOU. ⟶



JOB STEPS

4. ASK YOUR INSTRUCTOR TO CHECK BOTH HONES. HE WILL MAKE SURE YOU KNOW WHICH HONE TO USE AND WHICH STONE IS USED FOR CAST IRON OR ALUMINUM.

small engine repair

unit: ENGINE BLOCK MACHINING AND TOOLS

capital area career center

module: 7501 16 005 7 **date:** 4/16/77 **level:** I

skill title: HOW TO USE A TORQUE WRENCH

developed & written by: DANIEL M. WOODWARD

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO USE A TORQUE WRENCH TO TIGHTEN BOLTS.

AND IN ORDER TO DO THIS YOU WILL NEED:

A TORQUE WRENCH

SOCKET TO FIT WRENCH DRIVE

ENGINE BLOCK WITH THE HEAD IN PLACE

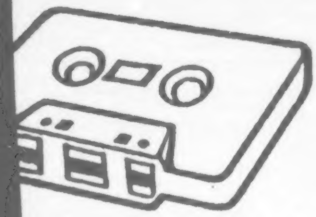
SAFETY GLASSES

WORD GUIDE

SPECIFICATIONS - MANUFACTURERS DIRECTIONS OR DESCRIPTION.

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE COMPLETED THE JOB STEPS AND TIGHTEN THE HEAD ON THE ENGINE TO THE CORRECT SPECIFICATIONS.



A TAPE OF THIS MODULE IS AVAILABLE.

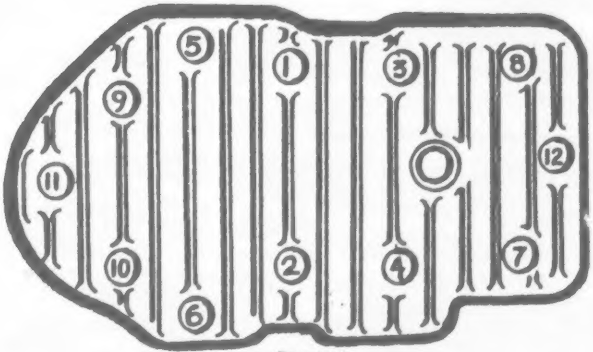
INFORMATION

WITH A TORQUE WRENCH, YOU CAN PROPERLY TIGHTEN A BOLT OR NUT ACCORDING TO SPECIFICATIONS.

ENGINE-PROCEDURES SET CERTAIN LIMITS ON NUT AND BOLT-TIGHTNESS. YOU MAY RUIN ENGINES BY NOT FOLLOWING THESE SPECIFICATIONS.

THERE IS A CORRECT WAY TO TIGHTEN DOWN A CYLINDER HEAD. START FROM THE MIDDLE AND GO OUTWARD.

FOLLOW THE NUMBERS ON THE CYLINDER HEAD BELOW!



INFORMATION

SOME TORQUE WRENCHES ARE LARGER THAN OTHERS. THIS COULD MEAN THAT THE SMALLER WRENCH IS FOR "INCH POUNDS OF TIGHTNESS" AND THAT THE LARGER WRENCH IS FOR "FOOT POUNDS OF TIGHTNESS". MOST SMALL-ENGINE INSTRUCTIONS ARE IN "INCH POUNDS". A "FOOT POUND" IS 12 TIMES MORE TORQUE THAN AN INCH POUND. TEN FOOT POUNDS WOULD BE THE SAME TIGHTNESS AS 120 INCH POUNDS.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

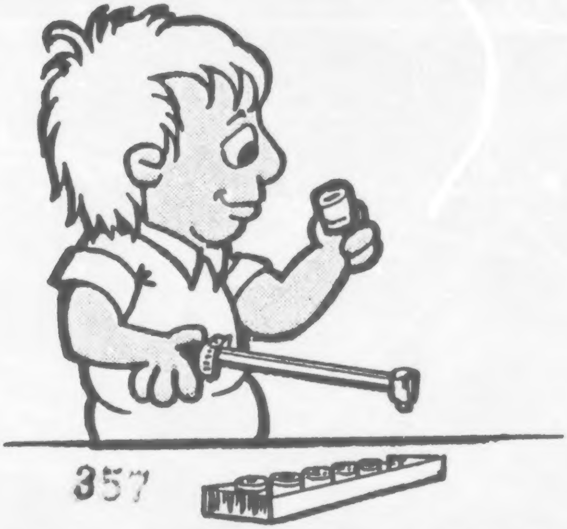
JOB STEPS

1. GET YOUR TORQUE WRENCH AND GO TO YOUR WORK AREA.

2. FIND OUT THE TORQUE FOR THE CYLINDER HEAD BOLTS ON YOUR ENGINE.

   NOTE: THEY ARE USUALLY AROUND 140 TO 180 "INCH POUNDS". CHECK YOUR SERVICE MANUAL.

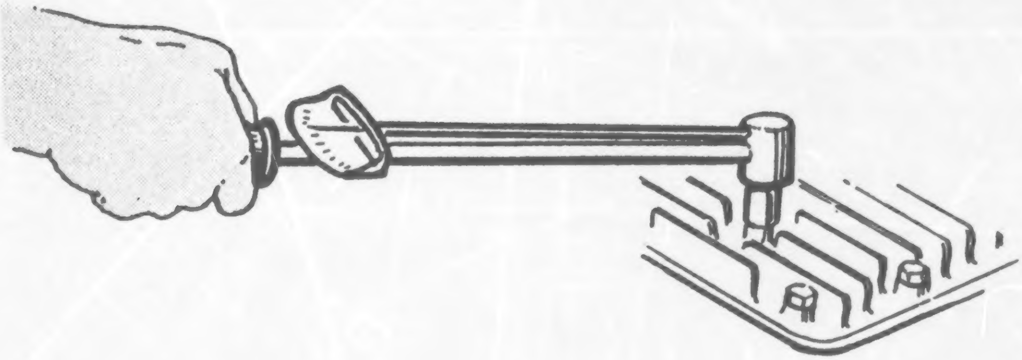
3. SELECT THE CORRECT SOCKET FOR THE HEAD BOLT.



JOB STEPS

4. PLACE THE SOCKET ONTO THE TORQUE WRENCH.

5. PLACE ONE HAND ON THE HANDLE OF THE TORQUE WRENCH AND THE OTHER HAND ON THE HEAD OF THE WRENCH. THEN, LOOSEN THE CYLINDER HEAD BOLTS.



JOB STEPS

6. USING THE CORRECT TIGHTENING ORDER (FROM THE INFORMATION SECTION OF THIS MODULE), TIGHTEN ALL CYLINDER HEAD BOLTS TO 60 "INCH POUNDS".

7. TIGHTEN ALL CYLINDER HEAD BOLTS TO 100 "INCH POUNDS" (AGAIN USING THE CORRECT TIGHTENING ORDER).

8. FINISH TIGHTENING TO THE CORRECT SERVICE MANUAL SPECIFICATIONS.

9. PRACTICE WITH THE WRENCH UNTIL YOU FEEL YOU KNOW HOW TO USE IT PROPERLY.

10. PUT EACH TOOL IN ITS PROPER PLACE.

small engine repair

unit: TUNE UP

capital area career center

module: 7501 18 002 7 date: 1/75 level: +

skill title: TUNE UP ENGINE ON RIDING MOWER (MINOR)

developed & written by: JIM PITTS AND DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TUNE UP AN AIR COOLED ENGINE ON A RIDING LAWN MOWER.

AND IN ORDER TO DO THIS YOU WILL NEED:

NECESSARY REPLACEMENT PARTS

MERCOTRONIC TESTER

HAND TOOLS

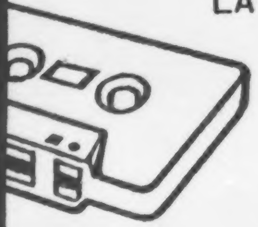
TORQUE WRENCH

SAFETY GLASSES

WE WILL KNOW THAT YOU CAN DO IT WHEN:

A. YOU CAN START THE ENGINE IN 3 PULLS OR, IF IT HAS AN ELECTRIC START, YOU CAN START IT EASILY.

B. THE ENGINE RUNS AND IDLES UP TO MAXIMUM SPECIFIED R.P.M.'S (AS ALLOWED BY THE BLADE-TIP SPEED LAW).



A TAPE OF THIS MODULE IS AVAILABLE.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

THERE ARE MANY DIFFERENT KINDS OF RIDING LAWN MOWERS. YOU WILL HAVE TO GET THE SPECIFIC MANUAL FOR THE KIND OF MOWER ON WHICH YOU ARE WORKING.

A TUNE-UP INCLUDES:

CLEANING THE CARBURETOR AND GAS TANK

CLEANING THE CARBON OUT OF THE HEAD AND VALVES

CHANGING THE OIL

CHECKING THE MAGNETS (AND TIMING, IF NECESSARY)

REPLACING THE SPARK PLUG

CHECKING THE VALVES AND SEATS

CLEANING THE AIR FILTER

INFORMATION

CHANGING THE POINTS AND CONDENSER

TORQUING THE HEAD BOLTS

ADJUSTING THE THROTTLE

ADJUSTING THE GOVERNOR

CLEANING THE MOWER

NOTE: AS YOU FIND WORN OR BROKEN PARTS, MAKE A LIST SO YOU CAN ORDER NEW ONES.

JOB STEPS

1. PUT ON YOUR SAFETY GLASSES AND GO TO YOUR WORK AREA.

2. REMOVE THE HOOD, (IF IT WILL GET IN THE WAY).

3. REMOVE THE CARBURETOR, AS YOU LEARNED IN MODULE 5101 05 005.

4. OVERHAUL THE CARBURETOR, AS YOU LEARNED IN MODULES:

   7501 05 001

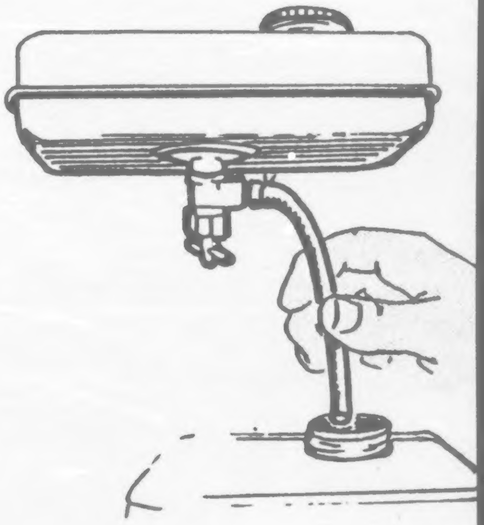
   7501 05 002

   7501 05 003

   7501 05 004

JOB STEPS

5. DRAIN THE FUEL TANK. THEN, IF IT HAS ONE, CLEAN THE FILTER SCREEN AS YOU LEARNED IN MODULE 7501 04 001.

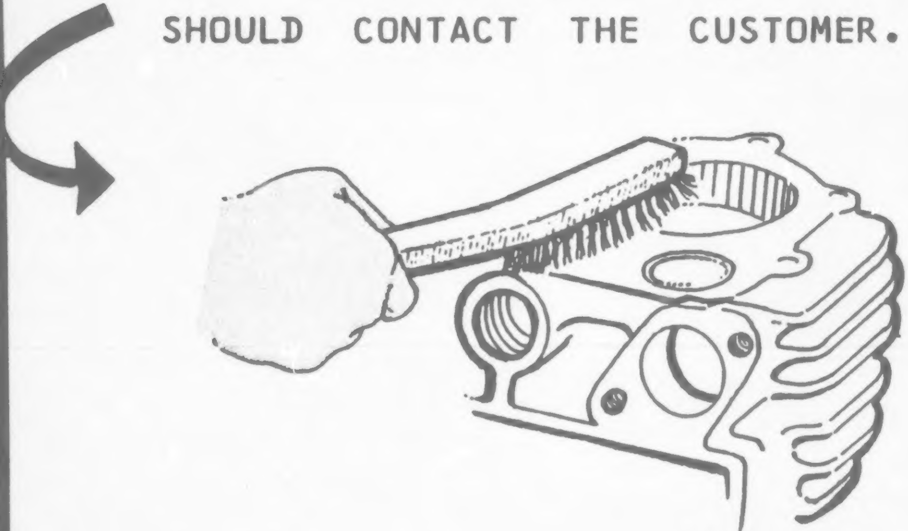


6. DRAIN THE OIL FROM THE ENGINE, AS YOU LEARNED IN MODULE 7501 09 001.

7. REMOVE THE HEAD, AS YOU LEARNED IN MODULE 7501 01 003.

JOB STEPS

8. USING CARBON SCRAPER, AND WIRE BRUSH, CLEAN THE CARBON FROM THE HEAD, PISTON, AND VALVES. THEN, CHECK THE VALVES TO SEE IF THEY SHOULD BE GROUND. IF SO, DO A MAJOR TUNE UP. THIS WILL BE MORE EXPENSIVE SO YOU SHOULD CONTACT THE CUSTOMER.



JOB STEPS

9. REMOVE THE AIR HOUSING.

10. REMOVE THE FLYWHEEL. REMEMBER: THERE IS A PROPER WAY TO DO THIS FOR EACH DIFFERENT MAKES OF ENGINES. (SEE MODULE 7501 08 009).

11. CLEAN THE MAGNETS AREA.

12. USING MERCOTRONIC TESTER, CHECK THE MAGNETS. REPLACE THE POINTS AND CONDENSER. GAP POINTS PROPERLY. (SEE MODULE 7501 08 002).

JOB STEPS

13. TIME THE MAGNETS (IF IT IS THE TYPE THAT NEEDS TIMING). FOLLOW THE STEPS IN MODULE 7501 14 001.

14. FINISH ASSEMBLING THE MAGNETS. (SEE MODULE 7501 08 003).

15. INSTALL THE FLYWHEEL. USING TORQUE WRENCH, TORQUE IT. YOU WILL HAVE TO FIND THE PROPER TORQUE SPECIFICATION IN THE SERVICE MANUAL.

16. CLEAN THE AIR FILTER, AS YOU LEARNED IN MODULE 7501 02 001.

JOB STEPS

17. INSTALL THE HEAD. USING THE TORQUE WRENCH, TORQUE IT, AS SHOWN IN MODULE 7501 01 003.

18. REPLACE THE SPARK PLUG. INSTALL THE CARBURETOR, AS YOU LEARNED IN MODULE 7501 05 005.

19. INSTALL THE AIR HOUSING.

20. PUT OIL IN THE ENGINE, AS YOU LEARNED IN MODULE 7501 09 001.

21. PUT GAS IN THE FUEL TANK. TURN OFF THE SHUT-OFF VALVE.

JOB STEPS

22. START THE ENGINE AND LET IT WARM UP. SHUT OFF THE ENGINE.

23. CHECK THE TORQUE ON THE HEAD BOLTS, AS YOU LEARNED IN MODULES 7501 01 003.

24. START THE ENGINE AND ADJUST THE THROTTLE CONTROL, CARBURETOR IDLE AND HIGH SPEED JETS. (REFER TO MODULE 7501 05 007).

25. ADJUST THE GOVERNOR, AS YOU LEARNED IN MODULE 7501 05 006.

26. REPLACE THE HOOD.

TURN PAGE →

JOB STEPS

27. CLEAN THE MOWER.

28. HAVE THE INSTRUCTOR CHECK YOUR WORK.

small engine repair

unit: TUNE-UP

capital area career center

module: 7501 18 003 7

date: 3/77

level: IV

skill title: TUNE-UP ENGINE CHAINS

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

UNDER LOAD - WITH SAW STALLED IN A CUT.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

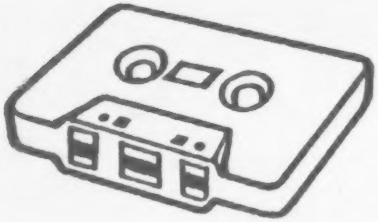
HOW TO TUNE-UP A CHAIN SAW.

AND IN ORDER TO DO THIS YOU WILL NEED:

CHAINSAW
SET OF TOOLS
SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

THE ENGINE WILL START IN FIVE PULLS, THE SAW WILL RUN PROPERLY UNDER LOAD, AND THE CHAIN WILL NOT RUN WHEN THE ENGINE IS AT IDLE.



A TAPE OF THIS MODULE IS AVAILABLE.

CAUTION: BEFORE YOU USE ANY TOOLS, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU.

WEAR YOUR SAFETY GLASSES.

INFORMATION

GET THE CHAINSAW MANUAL AND LOOK UP THE SPECIFICAITONS FOR THE SAW YOU ARE WORKING ON. READ AS MUCH AS YOU CAN ABOUT THE SAW. DOES MAGNETO HAVE TO BE TIMED? IF YES, HOW?

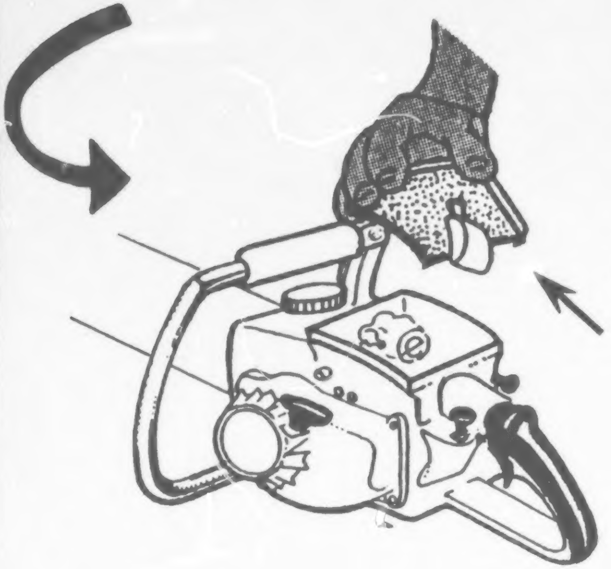
REMEMBER WHAT WAS DONE IN OTHER TUNE-UPS AND THE ORDER YOU DID THEM IN. FOLLOW THE STEPS.

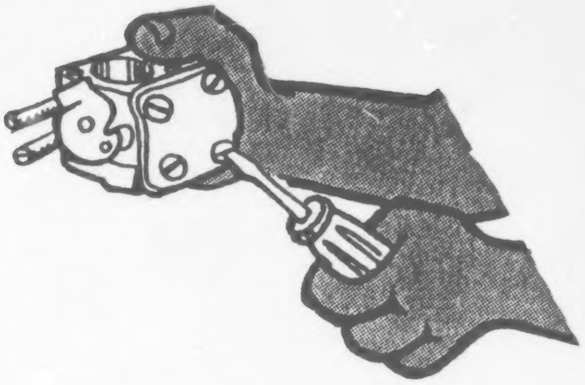
PARTS USUALLY REPLACED IN A TUNE-UP ARE:

1. SPARK PLUG
2. POINT SET
3. CONDENSER
4. CARBURETOR KIT
5. ANY GASKETS THAT HAVE TO BE REMOVED.

JOB STEPS

1. REMOVE THE AIR FILTER. CHECK TO BE SURE IT IS NOT TOO DIRTY.

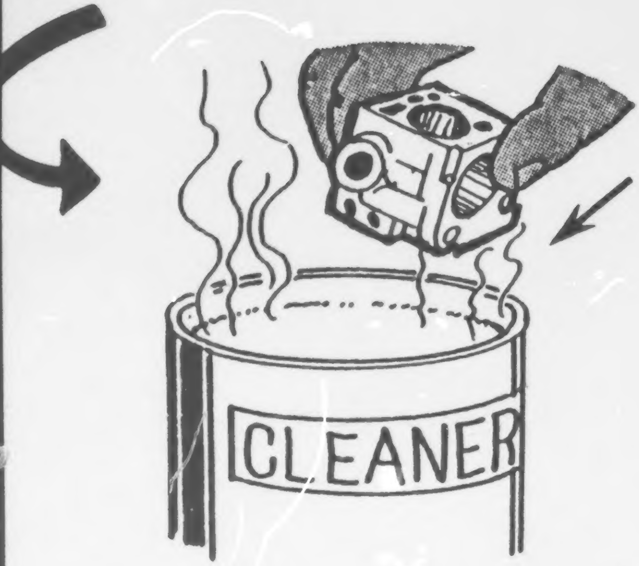


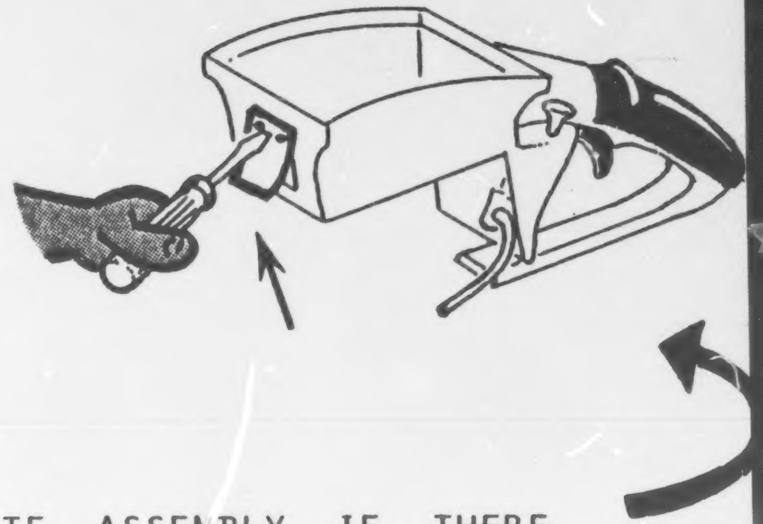


2. REMOVE THE CARBURETOR AND DISASSEMBLE IT.

JOB STEPS

3. PUT THE CARBURETOR IN THE CLEANER.

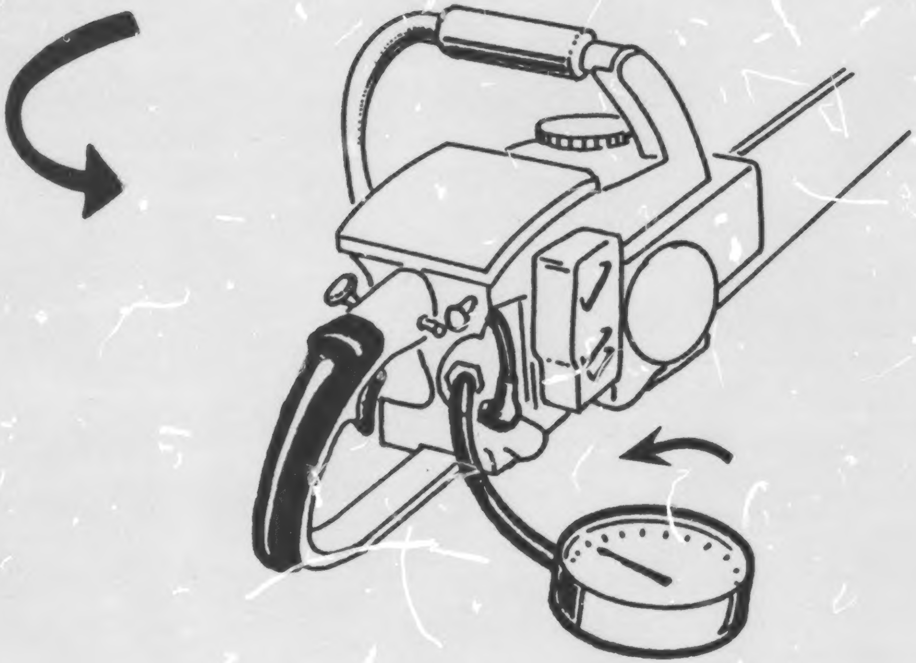




4. CHECK THE REED PLATE ASSEMBLY IF THERE IS ONE.

JOB STEPS

5. TAKE A COMPRESSION CHECK.



6. DISASSEMBLE THE MAGNETO AND CHECK THE SPARK PLUG FOR WEAR AND GAP.

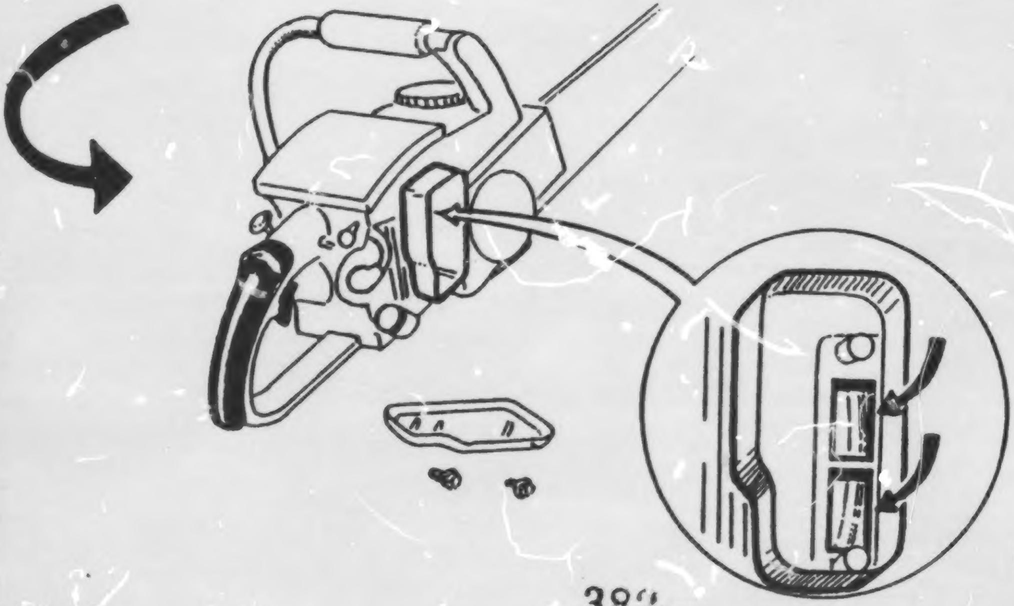
7. CHECK THE COIL AND CONDENSER.

JOB STEPS

8. MAKE A LIST OF PARTS YOU WILL NEED AND TAKE THE LIST TO THE PARTS DEPARTMENT.

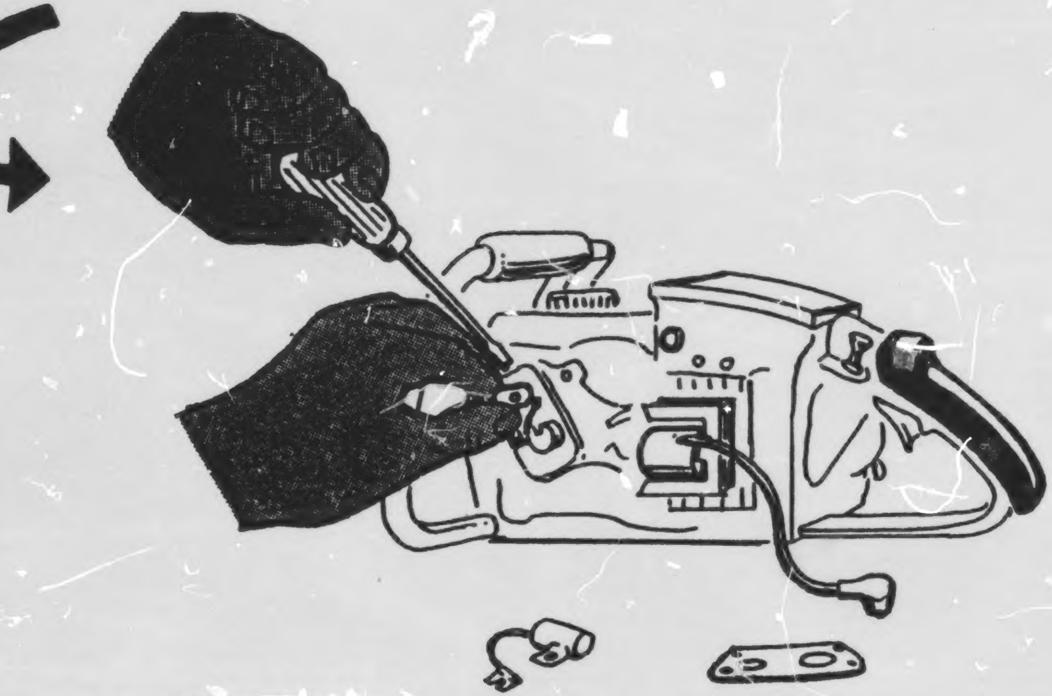
9. GO BACK TO YOUR BENCH AND CLEAN UP THE SAW.

10. BE SURE EXHAUST PORTS ARE CLEAR.



JOB STEPS

11. INSTALL THE POINTS AND CONDENSER (RE-TIME IF NEEDED)

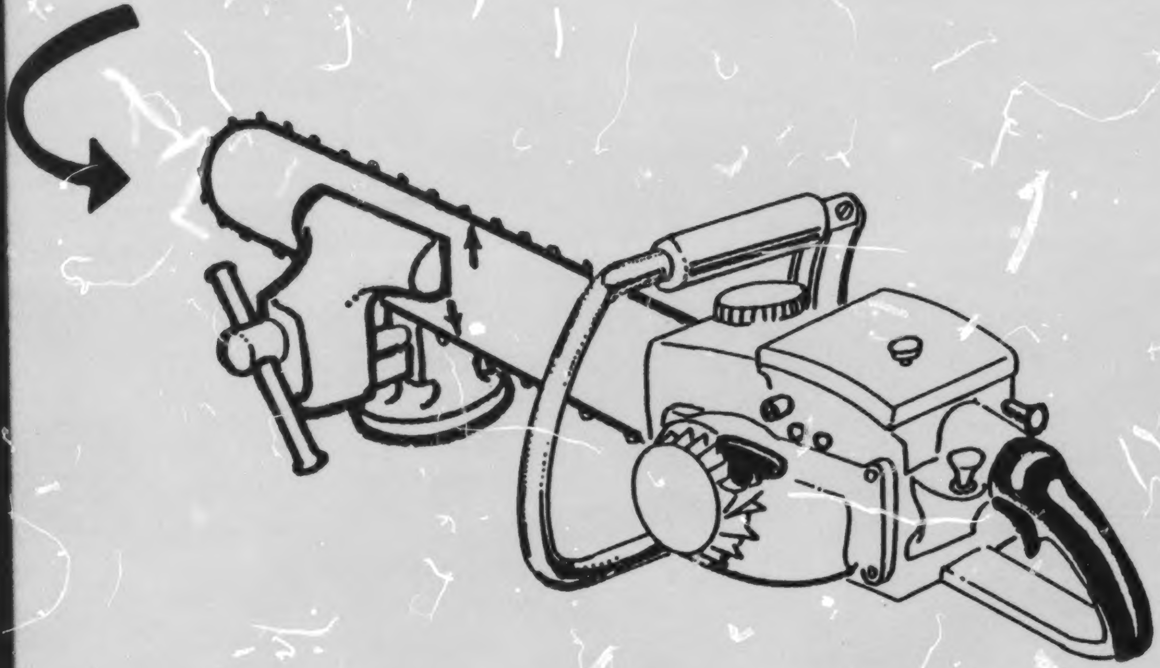


12. INSTALL THE REED PLATE IF IT WAS REMOVED AND ASSEMBLE THE CARBURETOR. INSTALL THE CARBURETOR KIT.

JOB STEPS

13. INSTALL NEW GASKET AND THEN THE CARBURETOR.

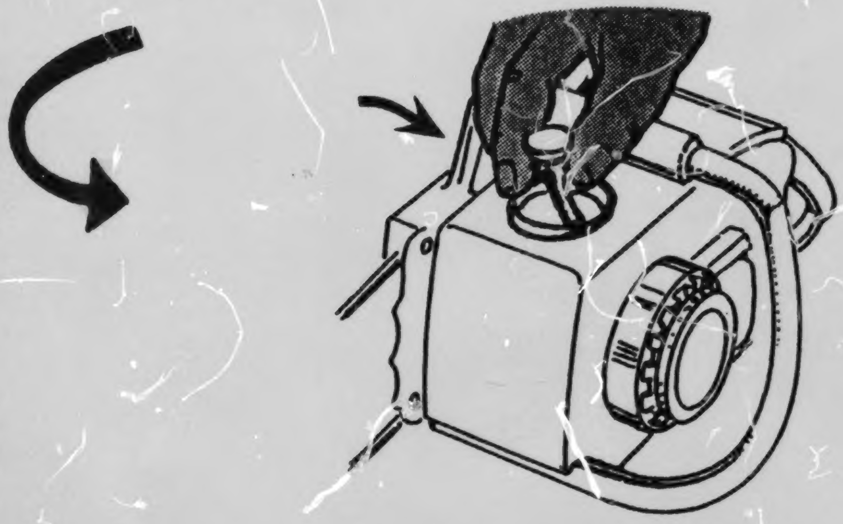
14. CLAMP THE SAW IN A VISE, BUT BE SURE THE CHAIN ISN'T TOUCHING THE VISE.



JOB STEPS

15. REMOVE THE GAS CAP AND PULL OUT THE INTERNAL GAS LINE AND FUEL FILTER. MOST OF THEM HAVE A COTTON FILTER IN THE END OF THE LINE. SOME OF THEM HAVE METAL FILTERS. CHECK THIS FILTER. IF METAL, TRY TO BLOW THROUGH IT.

16. PUT THE FILTER AND GAS LINE BACK IN THE TANK.



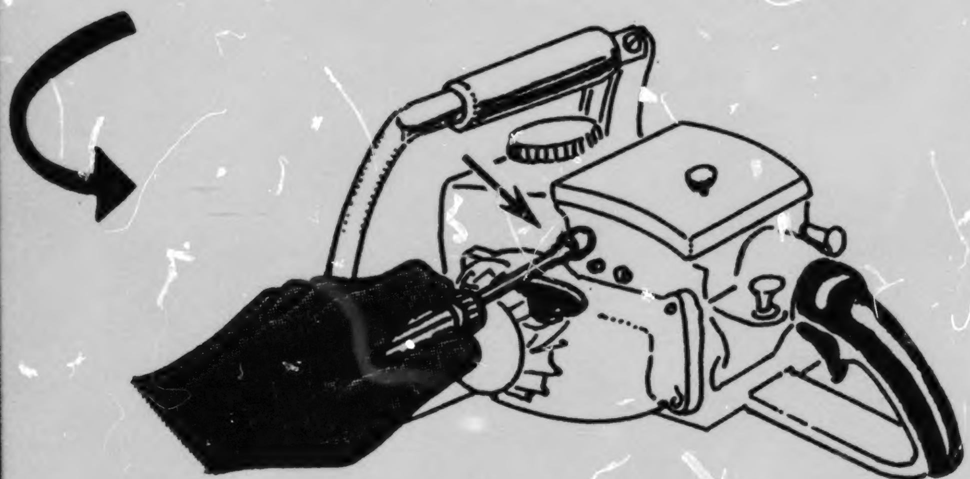
JOB STEPS

17. FILL WITH CLEAN FUEL.

18. BE SURE IGNITION SWITCH IS AT THE ON POSITION.

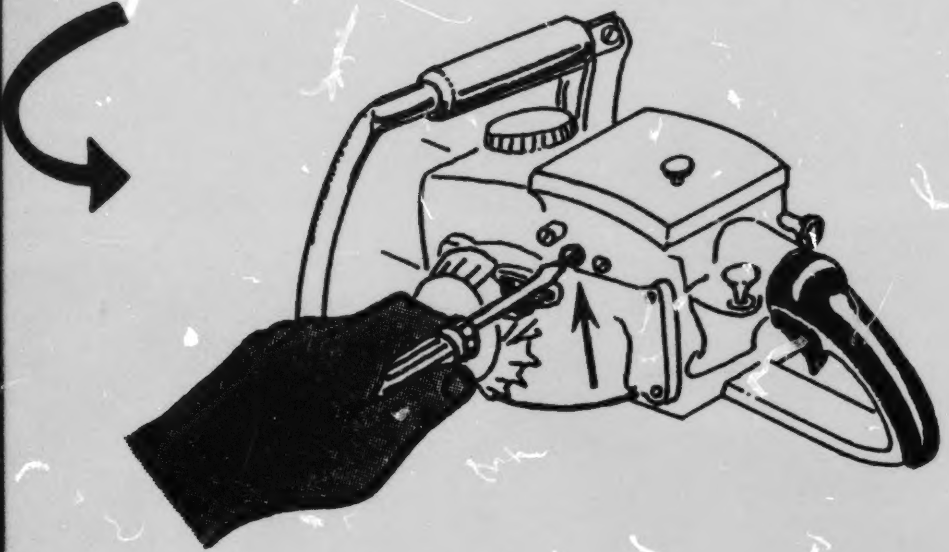
19. START AND ALLOW TO WARM UP.

20. ADJUST IDLE SPEED SCREW SO ENGINE RUNS JUST BELOW CLUTCH ENGAGEMENT SPEED.



JOB STEPS

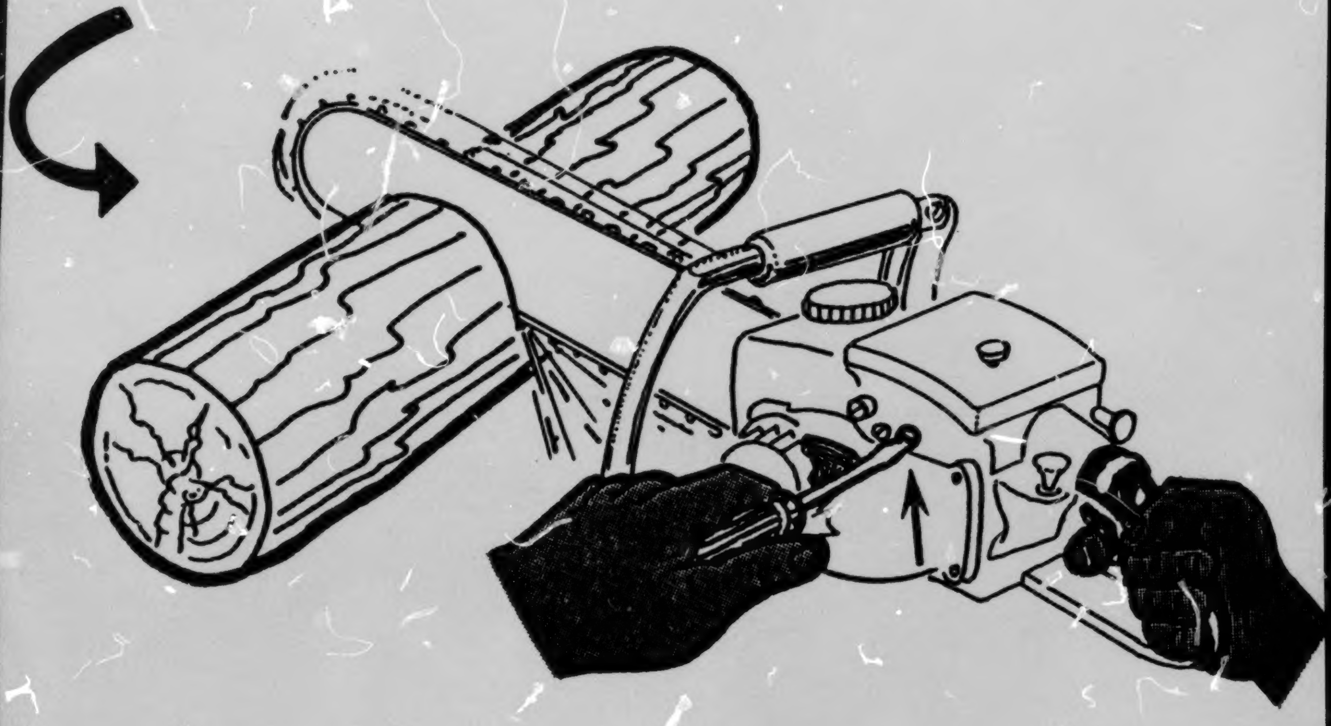
21. THEN ADJUST IDLE FUEL MIXTURE NEEDLE SO ENGINE RUNS SMOOTHLY.



22. REMOVE SAW FROM VISE. TAKE SAW TO SAFE AREA OR WOODPILE.

JOB STEPS

23. WITH ENGINE AT FULL THROTTLE UNDER LOAD, ADJUST MAIN FUEL NEEDLE SO ENGINE RUNS AT HIGH SPEED WITHOUT SMOKING.



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JOB STEPS

24. ALLOW ENGINE TO IDLE. RE-ADJUST IF NECESSARY.

25. WHEN SAW OPERATES SMOOTHLY TURN IT OFF.

small engine repair

unit: TUNE UP

capital area career center

module: 7501 18 004 7 **date:** 6/77 **level:** IV

skill title: TUNE UP ENGINE, SNOWMOBILE

developed & written by: DON FOSTER AND JIM PITTS

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO TUNE UP AN AIR-COOLED, SNOWMOBILE ENGINE.

AND IN ORDER TO DO THIS YOU WILL NEED:

A SNOWMOBILE ENGINE

OHM METER OR MERCOTRONIC TESTER

NECESSARY REPLACEMENT PARTS

COMPRESSION TESTER (GAUGE)

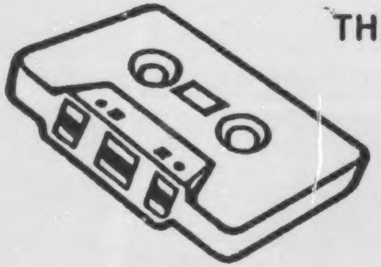
DYNAMOMETER

TORQUE WRENCH

SAFETY GLASSES

WE WILL KNOW YOU CAN DO THIS WHEN:

1. YOU CAN START THE ENGINE WITHIN 5 PULLS OF STARTER HANDLE.
2. YOU CAN KEEP THE TRACK FROM TURNING WHEN MOUNTED ON THE DYNAMOMETER.
3. YOU CAN ADJUST THE TRACK TO MAXIMUM TOP SPEED WHILE IT'S UNDER LOAD ON THE DYNAMOMETER.



A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

INFORMATION

THERE ARE MANY DIFFERENT KINDS OF SNOWMOBILE ENGINES. YOU WILL HAVE TO GET THE SPECIFIC MANUAL FOR THE KIND OF SNOWMOBILE ENGINE ON WHICH YOU WILL WORK.

A TUNE UP INCLUDES:

1. CLEANING THE CARBURETOR AND GAS TANK
2. CHECKING THE MAGNETO
3. SETTING THE TUNING
4. REPLACING THE SPARK PLUG
5. CLEANING THE POINTS AND CONDENSER
6. TORQUING THE HEAD BOLTS
7. ADJUSTING THE THROTTLE
8. CLEANING THE SNOW MACHINE

AS YOU FIND WORN OR BROKEN PARTS, LIST THEM SO YOU CAN ORDER NEW ONES.

JOB STEPS

1. GET ALL EQUIPMENT AND GO TO YOUR WORK AREA.

CAUTION - WEAR YOUR SAFETY GLASSES!

NOTE: MOST SNOWMOBILE ENGINES CAN BE WORKED ON WITHOUT REMOVING ENGINE FROM THE CHASIS.

2. REMOVE THE CARBURETOR (OR CARBURETORS), AS YOU LEARNED IN MODULE 7501 05 005 7.

3. OVERHAUL THE CARBURETOR, AS YOU LEARNED IN MODULES:

   7501 05 001 7
   7501 05 002 7
   7501 05 003 7
   7501 05 004 7

JOB STEPS

4. DRAIN THE FUEL TANK.

5. CLEAN THE FILTER SCREEN, AS YOU LEARNED IN MODULE 7501 04 001 7.

6. REMOVE THE AIR HOUSING.

7. REMOVE THE FLYWHEEL, AS YOU LEARNED IN MODULE 7501 08 001 7.

8. CLEAN THE MAGNETO AREA.

9. CHECK THE MAGNETO.

10. REPLACE THE POINTS AND CONDENSER. THEN, SET THE POINTS TO THE PROPER GAP (SEE MODULE 7501 08 002 7).

JOB STEPS

11. ADJUST THE TIMING AS YOU LEARNED IN MODULE 7501 14 001 7.

12. USING A TORQUE WRENCH, INSTALL THE FLYWHEEL. BE SURE TO TORQUE THE FLYWHEEL. YOU WILL HAVE TO FIND THE PROPER TORQUE SPECIFICATION IN THE SERVICE MANUAL.

13. TAKE OUT THE SPARK PLUG.

14. USING A COMPRESSION GAUGE, CHECK THE COMPRESSION. SEE THE SERVICE MANUAL FOR COMPRESSION SPECIFICATIONS.

15. USING A TORQUE WRENCH, TORQUE THE HEAD BOLTS, AS SHOWN IN MODULE 7501 01 003 7.

JOB STEPS

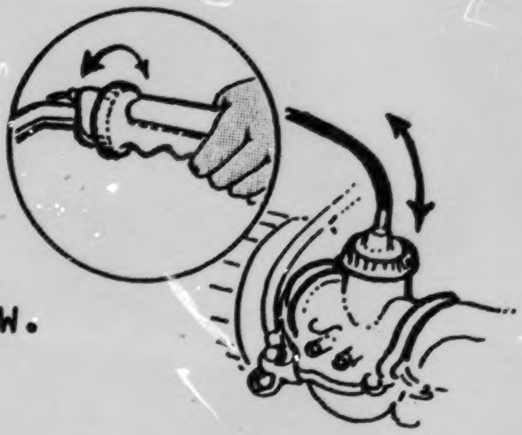
16. PUT IN A NEW SPARK PLUG.

17. INSTALL THE CARBURETOR, AS YOU LEARNED IN MODULE 7501 05 005 7.

18. INSTALL THE AIR HOUSING.

19. PUT THE SNOWMOBILE ON THE DYNAMOMETER.

20. CHECK THE THROTTLE CABLE. BE SURE THAT THE THROTTLE SHAFT RETURNS TO THE IDLE POSITION AGAINST THE IDLE STOP-SCREW.



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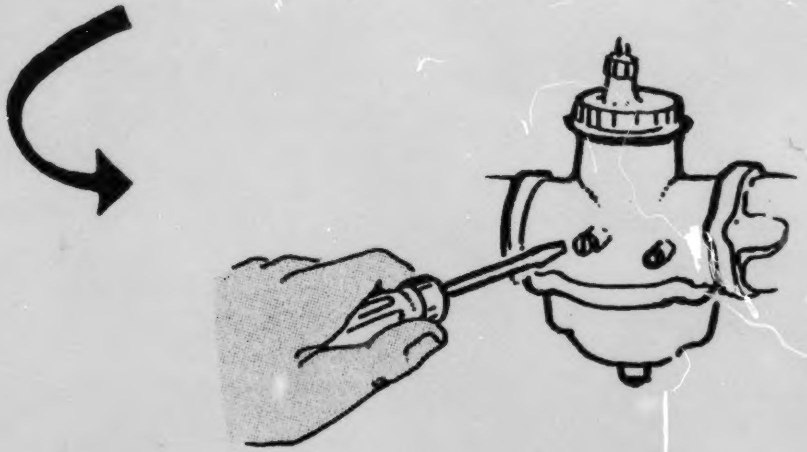
JOB STEPS

21. START THE ENGINE. ADJUST THE IDLE AND HIGH SPEED JETS. SEE MODULE 7501 05 007 7.



22. CLEAN THE SNOWMOBILE.

23. BE SURE THE TRACK DOES NOT TURN WHEN THE ENGINE IS IDLING.

24. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: SHORT BLOCKS

capital area career center

module: 7501 19 002 7 **date:** 7/77 **level:** IV

skill title: INSTALL A SHORT BLOCK IN A FOUR-CYCLE ENGINE

developed & written by: JIM PITTS

visuals by: DAVE WEHRWEIN

WORD GUIDE

INSTALL - PUT IN.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO INSTALL A SHORT BLOCK IN A FOUR-CYCLE ENGINE.

IN ORDER TO DO THIS YOU WILL NEED:

HAND TOOLS
MODS YOU HAVE DONE BEFORE (SEE INFORMATION PAGE)
SERVICE MANUAL

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE REMOVED AND INSTALLED A SHORT BLOCK ON A FOUR-CYCLE ENGINE ACCORDING TO SERVICE SPECIFICATIONS.

A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

A NEW SHORT BLOCK COMES WITH RODS, PISTONS, VALVES, AND OTHER INTERNAL ENGINE PARTS. THE CARBURETOR, MUFFLER, STARTER, MAGNETO, AND OTHER PARTS ATTACHED TO THE OUTSIDE OF THE BLOCK MUST BE TAKEN OFF THE OLD BLOCK AND PUT ONTO THE NEW ONE. FOR THIS, YOU SHOULD REFER TO SEVERAL MODS YOU HAVE ALREADY DONE. IF YOU CANNOT REMEMBER WHAT IS IN THESE MODS, READ THEM OVER AGAIN. THESE MODS ARE:

7501	01	021	CRANKSHAFT
7501	05	000	CARBURETORS
7501	15	000	REMOVE AND REPLACE ENGINE
7501	01	003	REMOVE AND REPLACE HEAD
7501	08	000	MAGNETOS
7501	03	001	REMOVE AND REPLACE STARTER

INFORMATION

SOME SHORT BLOCKS, MADE BY TECUMSEH, ARE CALLED "CRANKLESS" SHORT BLOCKS. IN THESE, THE CRANKSHAFT IS NOT INSTALLED BUT COMES IN THE BOX WITH THE SHORT BLOCK. YOU WILL HAVE TO INSTALL AND TORQUE IT YOURSELF, BEFORE INSTALLING THE SHORT BLOCK.

JOB STEPS

DO NOT WRITE ON THIS MODULE

1. TAKE ALL EQUIPMENT AND MATERIALS TO YOUR WORK AREA.

2. REMOVE THE SHORT BLOCK FROM THE BOX. IS IT A "CRANKLESS" SHORT BOX? IF SO, GO ON TO JOB STEP #3.

3. CHECK THE SHORT BLOCK.

    1. IS THE CRANKSHAFT THE SAME ON THE P.T.O. END? YES ____________ NO ____________

    2. IS THE CRANKSHAFT THE SAME ON THE FLYWHEEL? YES ____________ NO ____________

    NOTE: SOME CRANKSHAFTS IN BRIGGS AND STRATTON ENGINES HAVE DIFFERENT LENGTH ENDS ON THE FLYWHEEL END OF THE CRANKSHAFT.

JOB STEPS

3. IS THE EXHAUST HOLE COMING OUT OF THE SAME PLACE AS THE OLD ONE (SIDE OR BOTTOM)? YES __________ NO __________

4. IS THE EXHAUST VALVE IN THE SAME LOCATION (TOP OR BOTTOM)?
YES __________ NO __________

NOTE: SOME TECUMSEH ENGINES HAVE THE EXHAUST HOLE IN THE BOTTOM VALVE AND SOME HAVE THEM IN THE TOP VALVE HOLE. BE SURE THAT THE VALVE SET UP IS THE SAME ON THE TWO BLOCKS.

5. IS THE OIL FILL HOLE IN THE SAME POSITION ON BOTH BLOCKS?

YES __________ NO __________

JOB STEPS

6. ARE THE HEAD BOLTS THE SAME PATTERN?

YES ____________ NO ____________

7. AFTER YOU HAVE COMPLETELY CHECKED THE BLOCK AND ARE SATISFIED IT IS THE SAME, GO ON TO STEP 4.

YES ____________ NO ____________

4. IF YOU HAVE A TECUMSEH "CRANKLESS" SHORT BLOCK, INSTALL THE CRANKSHAFT INTO THE BLOCK (AS IN MOD 7501 01 021 7). THEN DO JOB STEP #5.

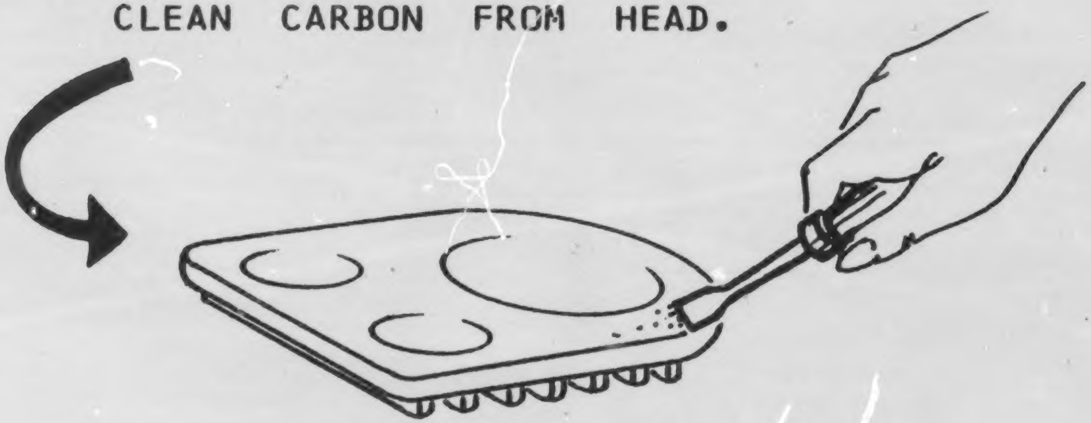
5. REMOVE THE CARBURETOR AND MANIFOLD FROM THE OLD BLOCK. DISASSEMBLE THE CARBURETOR AND PUT IT INTO THE CARBURETOR CLEANER. USE MODULE FROM UNIT 5.

6. REMOVE THE ENGINE FROM ITS MOUNT (IF MOUNTED). REFER TO UNIT 15 MODS.

JOB STEPS

7. REMOVE THE AIR HOUSING AND FLYWHEEL AND MAGNETO ASSEMBLY AND ALSO THE HEAD.

8. CLEAN UP ALL PARTS THAT WILL BE RE-USED. CLEAN CARBON FROM HEAD.

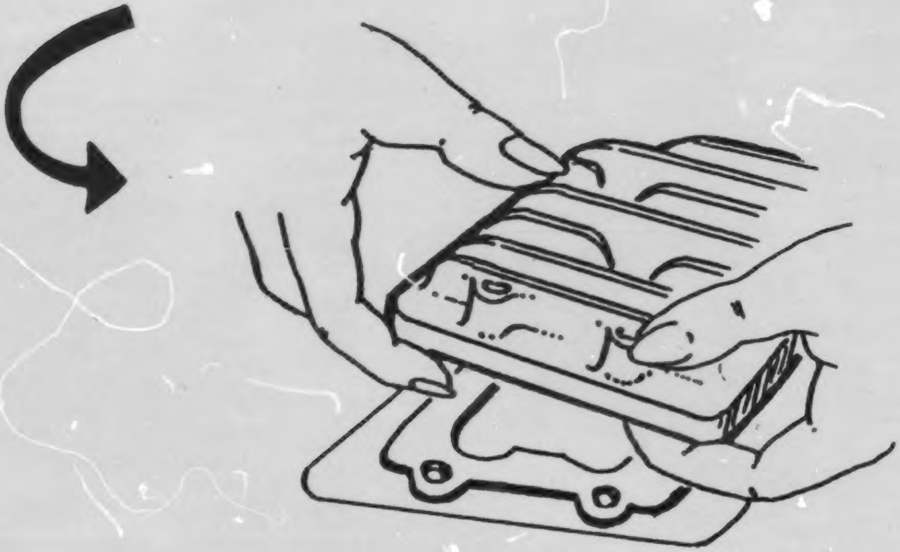


9. IF THE SHORT BLOCK IS A BRIGGS AND STRATTON MODEL, IT IS OK TO INSTALL THE HEAD AT THIS TIME. USE MODULE 7501 01 003 7.

NOTE: IF IT IS A TECUMSEH MODEL, YOU WILL HAVE TO INSTALL AND TIME THE MAGNETO BEFORE INSTALLING THE HEAD.

JOB STEPS

10. IF YOU ARE INSTALLING A TECUMSEH SHORT BLOCK, BEGIN BY INSTALLING THE HEAD.

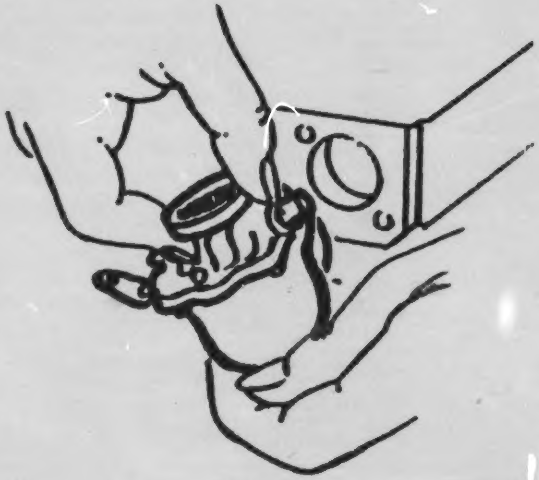


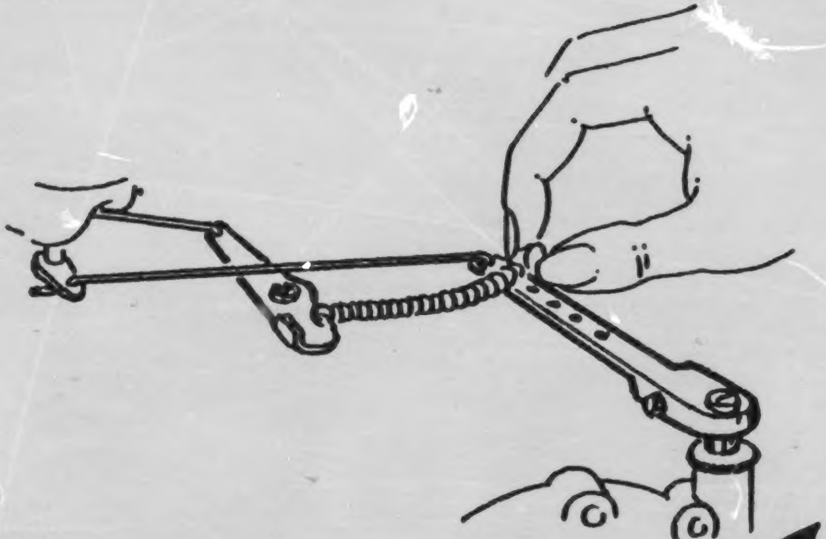
11. IF YOU ARE INSTALLING A BRIGGS AND STRATTON SHORT BLOCK, PUT IN NEW POINTS AND CONDENSER. REFER TO UNIT 8.

12. REMOVE THE CARBURETOR FROM THE CLEANER AND REBUILD. REFER TO UNIT 5.

JOB STEPS

13. INSTALL THE MANIFOLD AND CARBURETOR.





14. ADJUST THE GOVERNOR, IF NEEDED (THIS STEP USUALLY APPLIES ONLY TO MECHANICAL GOVERNORS). BUT BE SURE AIR VANE TYPE GOVERNORS ARE WORKING FREELY. REFER TO MOD 7501 05 006 7.

TURN PAGE →

JOB STEPS

15. INSTALL AIR HOUSING AND STARTER. REFER TO MOD 7501 03 001 7.

16. FILL THE ENGINE WITH THE PROPER OIL (FOR SUMMER OR WINTER) DEPENDING UPON WHEN THE ENGINE WILL BE USED.

17. BEFORE TURNING ON THE GAS TO THE CARBURETOR, SEE IF THE GAS TANK IS CLEAN. IF IT IS DIRTY, REMOVE IT, CLEAN IT, AND PUT FRESH GAS IN THE TANK.

18. START, ADJUST, AND CHECK THE ENGINE FOR PROPER GOVERNOR SETTINGS. REFER TO MOD 7501 05 006 7.

19. STOP THE ENGINE AND CLEAN IT UP FOR CUSTOMER PICK-UP.

20. NOW, ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: STORAGE

capital area career center

module: 7501 21 002 7 **date:** 2/77 **level:** I

skill title: PREPARING A CHAINSAW FOR STORAGE

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW AND WHY YOU PREPARE A CHAINSAW FOR STORAGE.

AND IN ORDER TO DO THIS YOU WILL NEED:

SET OF TOOLS

SAFETY GLASSES

CHAINSAW IN RUNNING ORDER

CAN OF OIL

WE WILL KNOW YOU CAN DO IT WHEN:

THE SAW YOU HAVE PREPARED IS READY FOR STORAGE AND YOU ARE ABLE TO CORRECTLY ANSWER YOUR INSTRUCTOR'S QUESTIONS ON THIS MODULE.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

YOU NEED THIS INFORMATION BECAUSE:

WHY DO YOU HAVE TO PREPARE A CHAINSAW FOR STORAGE?

BECAUSE GAS WILL TURN TO VARNISH IF LEFT IN A CARBURETOR ONE TO THREE MONTHS. THE VARNISH CAN PLUG UP HOLES IN THE CARBURETOR, AND THE ENGINE WILL NOT RUN PROPERLY. ALSO, THE CHAIN MAY RUST UP IF IT IS NOT LUBRICATED.

AND THE COMPRESSION RELEASE, (IF THE SAW HAS ONE) COULD ALLOW MOISTURE INTO THE CYLINDER IF IT IS LEFT OPEN.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

WORD GUIDE

GUIDE BAR - THE BAR THAT THE CHAIN RUNS IN ON A CHAIN-SAW.

JOB STEPS

1. REMOVE THE GAS CAP AND DUMP THE GAS OUT OF THE GAS TANK.

2. REMOVE THE AIR FILTER.

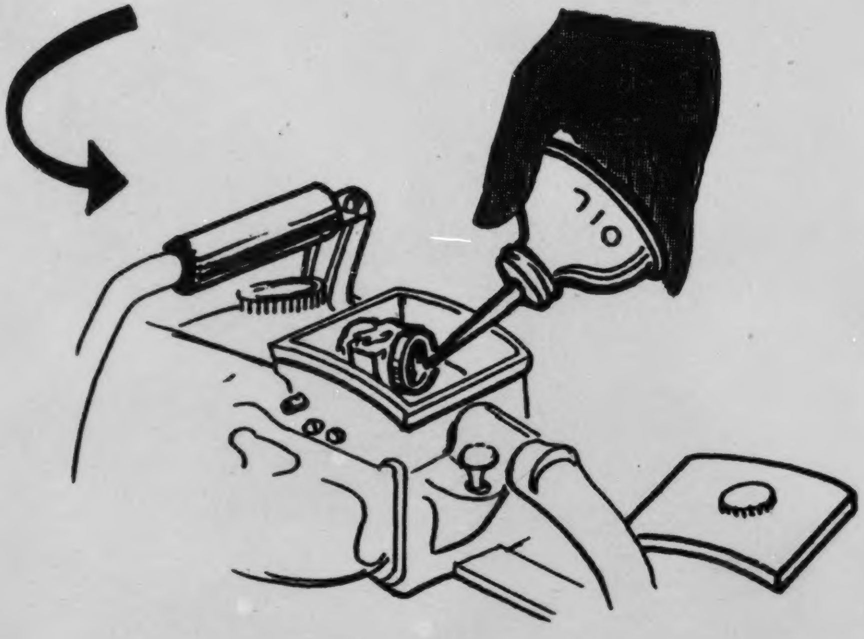
3. CLAMP THE GUIDE BAR IN A VISE BEING CAREFUL THAT THE CHAIN DOESN'T TOUCH ANY PART OF THE VISE.

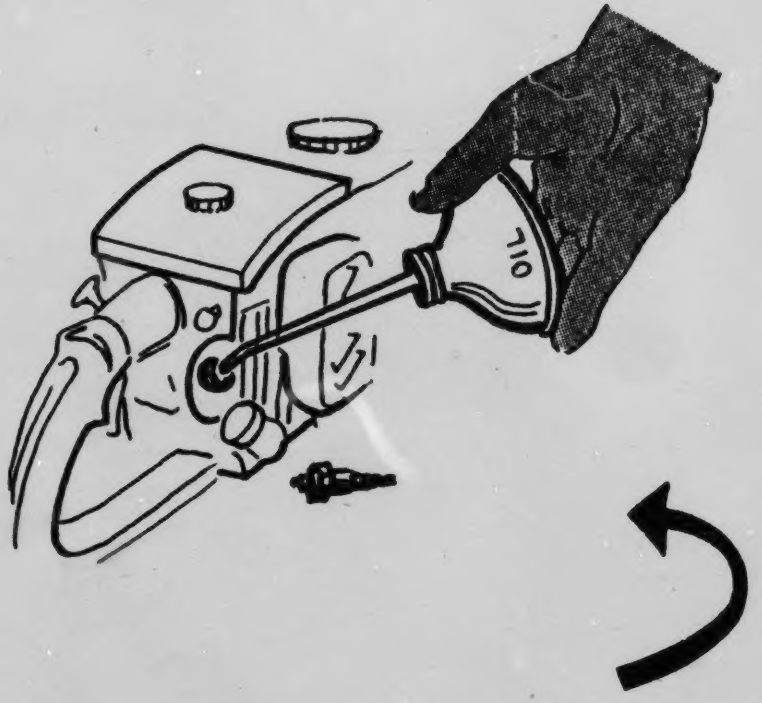
4. START THE ENGINE AND ALLOW IT TO RUN UNTIL IT QUITS.

5. KEEP RESTARTING THE ENGINE UNTIL IT WON'T START ANYMORE.

JOB STEPS

6. WHEN YOU ARE SURE ALL OF THE GAS IS OUT OF THE GAS LINE AND CARBURETOR, SQUIRT A SMALL AMOUNT OF OIL IN THE THROAT OF THE CARBURETOR.





7. REMOVE THE SPARK PLUG AND SQUIRT A SMALL AMOUNT OF OIL INTO THE SPARK PLUG HOLE. TURN THE ENGINE OVER WITH THE STARTER TO SPREAD THE OIL.

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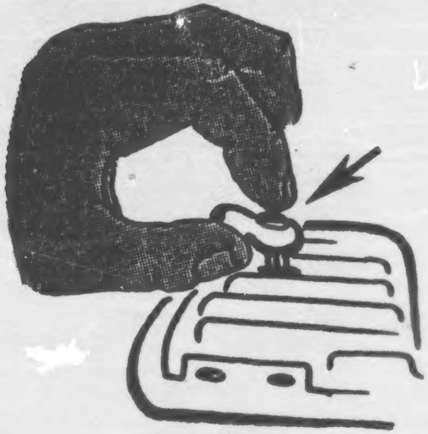
WORD GUIDE

COMPRESSION RELEASE - A DEVISE, USUALLY SPRINGLOADED, THAT IS USED TO LEAK COMPRESSION WHEN STARTING A CHAIN-SAW AND AFTER IT STARTS, THE RELEASE IS LOCKED OUT SO THAT YOU HAVE FULL COMPRESSION WHEN THE ENGINE IS RUNNING.

JOB STEPS

8. INSTALL THE SPARK PLUG BACK IN THE CYLINDER. PULL THE STARTER HANDLE UNTIL THE ENGINE IS ON THE COMPRESSION STROKE.

9. IF THE SAW HAS A COMPRESSION RELEASE, BE SURE THAT IT IS IN THE CLOSED POSITION.



TURN PAGE →

WORD GUIDE

BAR PROTECTOR - PUT OVER A BAR AND CHAIN ON A CHAINSAW TO PROTECT PEOPLE FROM GETTING CUT IF THEY ACCIDENTLY BUMP IT WHILE THE SAW IS RUNNING.

JOB STEPS

10. OIL THE CHAIN AND IF THE SAW HAS A BAR PROTECTOR, BE SURE TO PUT IT ON NOW.

small engine repair

unit:

capital area career center

module: 7501 23 001 7 date: 4/77 level: I

skill title: HOW TO REMOVE AND REPLACE PISTON RINGS

developed & written by: DON FOSTER AND DWIGHT SMITH

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE AND REPLACE PISTON RINGS, CLEAN RING GROOVES, AND CHECK RING LAND CLEARANCE.

AND IN ORDER TO DO THIS YOU WILL NEED:

A RING SET	SAFETY GLASSES
A PISTON AND ROD	
A VICE	

WE WILL KNOW THAT YOU CAN DO IT WHEN:

YOU HAVE:

A. REMOVED THE OLD RINGS.

. . . YOU CAN DO IT WHEN:

B. CLEAN ALL THE CARBON FROM THE RING GROOVES.

C. PUT THE NEW RINGS ON WITHOUT BREAKING ANY.

D. CHECK THE RING LAND CLEARANCE AND YOU CAN TELL IF THE PISTON NEEDS TO BE REPLACED.

A TAPE OF THIS MODULE IS AVAILABLE

INFORMATION

PISTON RINGS ARE MADE OF VERY HARD AND BRITTLE METAL. THEY WILL BREAK VERY EASILY, SO HANDLE THEM WITH CARE.

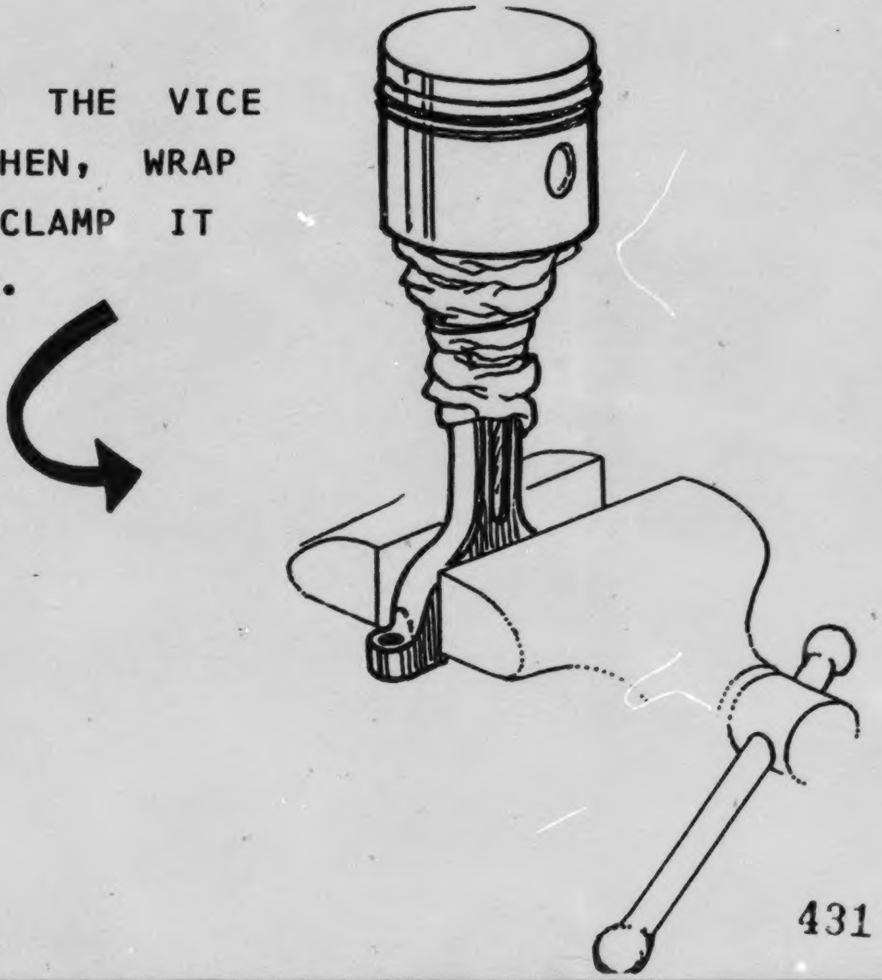
THE RINGS SEAL THE PISTON TO THE CYLINDER TO ALLOW THE ENGINE NECESSARY COMPRESSION. IF THERE IS CARBON UNDER THE RINGS, THE SEAL WILL BE POOR, THE ENGINE WILL WEAR OUT FAST AND BURN OIL. BE CAREFUL TO CLEAN THE RING GROOVES WHEN YOU REPLACE RINGS.

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

JOB STEPS

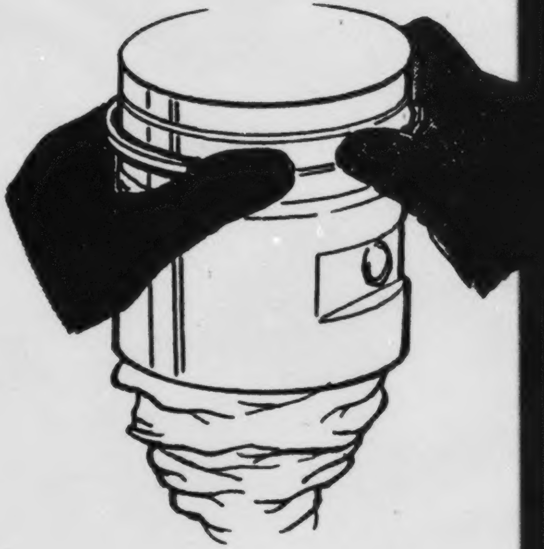
1. GET THE PISTON AND RING SET ON WHICH YOU WILL WORK.

2. PUT THE CONNECTING ROD IN THE VICE AND RIGHTEN IT LIGHTLY. THEN, WRAP THE ROD WITH A RAG AND CLAMP IT WITH THE PISTON FACING UP.



JOB STEPS

3. USING YOUR FINGERS ON THE RING-ENDS, SPREAD OPEN THE TOP RING. AT THE SAME TIME, PULL IT UP AND THEN, WHEN THE RING IS LARGER THAN THE PISTON, LIFT THE RING OFF THE PISTON. →



4. REPEAT JOB STEP 3 FOR THE SECOND RING.

5. USING A RING GROOVE CLEANER, CLEAN THE RING GROOVES. IF YOU DO NOT HAVE A RING GROOVE CLEANER, YOU CAN MAKE ONE THIS WAY:

    A. BREAK AN OLD RING IN HALF.

    B. GRIND ONE END FLAT AND THE OTHER SHARP.

    C. SCRAPE THE CARBON OUT OF THE RING GROOVES.

JOB STEPS

6. SPREAD THE NEW RINGS LIKE YOU DID IN JOB STEP 3 AND SLIP THEM ONTO THE PISTON.

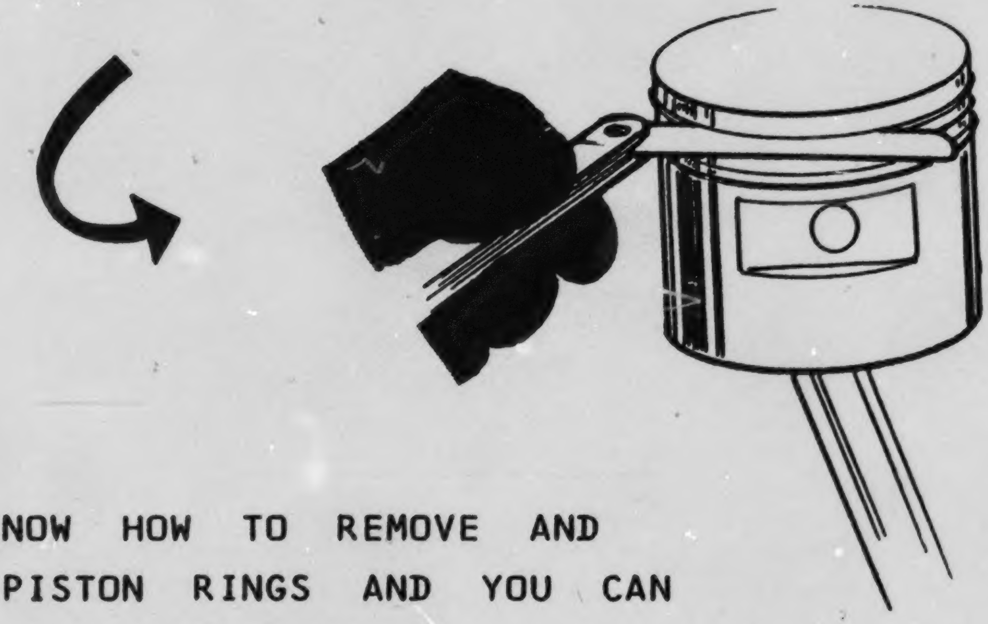
> **CAUTION** - BE CAREFUL NOT TO SPREAD THE RING ENDS TOO FAR OR THE RING WILL BREAK.

7. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

8. BEFORE CHECKING RING LAND CLEARANCES, READ REPAIR MANUAL IV, SECTION 9, PAGE 2.

JOB STEPS

9. PLACING THE PROPER FEELER GAUGE BETWEEN RING AND RING LAND, CHECK THE RING LAND CLEARANCE. IF THE CLEARANCE IS GREATER THAN WHAT THE MANUAL CALLS FOR, YOU MUST REPLACE THE PISTON.



NOW YOU KNOW HOW TO REMOVE AND PUT BACK PISTON RINGS AND YOU CAN CLEAN THE RING GROOVES.

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 23 002 7 date: 2/77 level: I

skill title: HOW TO INSTALL PISTON RINGS ON THE PISTON IN THE RIGHT ORDER

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

INSTALL - PUT IN.

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO INSTALL PISTON RINGS ON THE PISTON IN CORRECT ORDER.

IN ORDER TO DO THIS YOU WILL NEED:

- RING DISPLAY
- SET OF RINGS
- A PISTON

WE WILL KNOW YOU CAN DO IT WHEN:

YOU HAVE CORRECTLY INSTALLED PISTON RINGS ON THE PISTON IN THE RIGHT ORDER.

A TAPE OF THIS MODULE IS AVAILABLE.

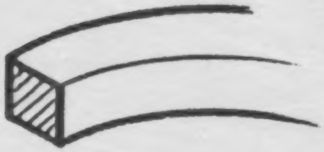
WORD GUIDE

GROOVE - NOTCH
GROOVELESS - WITHOUT ANY GROOVES
BEVEL - SLANTED SURFACE

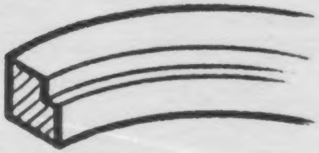
INFORMATION

MOST PISTONS HAVE THREE KINDS OF RINGS: A COMPRESSION RING, AN OIL SCRAPER RING, AND AN OIL RING.

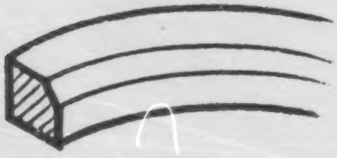
THE COMPRESSION RING GOES INTO THE TOP RING GROOVE ON THE PISTON. THERE ARE DIFFERENT TYPES OF COMPRESSION RINGS. HERE ARE THREE COMMON TYPES:



GROOVELESS RINGS MAY BE INSTALLED EITHER SIDE UP.



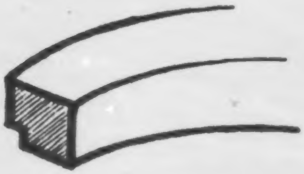
COMPRESSION RINGS WITH GROOVES MUST BE INSTALLED WITH THE GROOVE TOWARD THE TOP OF THE PISTON.



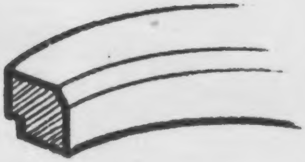
COMPRESSION RINGS WITH BEVELS MUST BE INSTALLED WITH THE BEVEL UP, TOWARD THE TOP OF THE PISTON.

INFORMATION

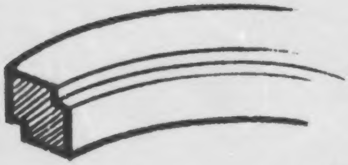
THE SECOND KIND OF RING, THE OIL SCRAPER RING, IS INSTALLED IN THE CENTER RING GROOVE ON THE PISTON. THE OIL SCRAPER RING HAS A GROOVE IN THE OUTSIDE OF THE RING AND MUST BE INSTALLED WITH THE GROOVE DOWN. HERE ARE THREE COMMON TYPES:



OIL SCRAPER RING (NOTE: GROOVE ON OUTSIDE OF RING) THIS RING MUST BE INSTALLED WITH OUTSIDE GROOVE TOWARD BOTTOM OF PISTON.



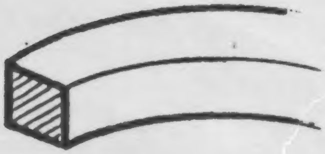
OIL SCRAPER RING (NOTE: GROOVE ON OUTSIDE AND BEVEL ON INSIDE). BEVEL GOES UP; GROOVE GOES DOWN.



OIL SCRAPER RING (NOTE: GROOVE ON OUTSIDE AND GROOVE INSIDE). INSIDE GROOVE GOES UP; OUTSIDE GROOVE GOES DOWN.

INFORMATION

THE THIRD KIND OF RING IS THE OIL RING. THIS RING GOES IN THE BOTTOM RING GROOVE ON THE PISTON. THERE IS ONE COMMON TYPE:



OIL RING - RING CAN BE INSTALLED EITHER WAY.

JOB STEPS

1. TAKE ALL EQUIPMENT TO YOUR WORK AREA.
2. GET THE RING DISPLAY FROM A-FRAME DISPLAY BOARD.
3. STUDY THE RINGS.
4. LOOK AT THE DRAWING OF EACH RING IN THE INFORMATION PAGE AND COMPARE DRAWINGS WITH THE RINGS.
5. SEPARATE THE COMPRESSION RINGS FROM THE OIL SCRAPER RINGS, THEN SHOW YOUR INSTRUCTOR.
6. ASK THE INSTRUCTOR FOR A SET OF RINGS AND A PISTON.
7. INSTALL THE RINGS IN THE RIGHT ORDER ON THE PISTON AS YOU HAVE LEARNED. MAKE SURE THE RINGS ARE INSTALLED WITH THE RIGHT SIDE UP ON THE PISTON.
8. ASK THE INSTRUCTOR TO CHECK YOUR WORK.

small engine repair

unit: RING SERVICE

capital area career center

module: 7501 23 003 7 date: 3/77 level: I

skill title: DEGLAZE CYLINDERS AND CHECK END GAP

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO DEGLAZE A CYLINDER ON AN ENGINE AND HOW TO CHECK THE PISTON RING END GAP.

IN ORDER TO DO THIS YOU WILL NEED:

A CYLINDER WITH THE PISTON REMOVED
B & S REPAIR MANUAL NO. IV
PISTON
SET OF RINGS
ELECTRIC DRILL MOTOR
DEGLAZING HONE
LUBRICANT

WE WILL KNOW YOU CAN DO IT WHEN:

1. THE CYLINDER YOU DEGLAZE HAS NO VARNISH OR GLAZE LEFT ON IT.
2. YOU CAN ANSWER THE QUESTIONS ABOUT DEGLAZING CYLINDERS.
3. YOU HAVE INSTALLED PISTON AND RINGS.
4. YOU HAVE MEASURED THE PISTON RING END GAP.

A TAPE OF THIS MODULE IS AVAILABLE.

WORD GUIDE

GLAZE - SMOOTH, SHINY SURFACE

INFORMATION

A CYLINDER THAT NEEDS GLAZING WILL LOOK SHINY. CYLINDERS SHOULD BE DEGLAZED SO THAT THE GLAZE IS BROKEN. IF A GLAZE REMAINS ON A CYLINDER WALL, NEW PISTON RINGS WILL NOT SEAT PROPERLY AND THE ENGINE WILL USE A LOT OF OIL. THIS IS VERY COMMON ON CAST IRON OR STEEL SLEEVE CYLINDERS.

IF YOU ARE USING CHROME RINGS, YOU DO NOT DEGLAZE THE CYLINDER. YOU ALSO DON'T HAVE TO DEGLAZE CYLINDERS ON AN ALUMINUM ENGINE, BUT IT WILL HELP THE RINGS TO SEAT IF YOU DO.

SOME ALUMINUM ENGINES HAVE STEEL SLEEVES ON THE CYLINDERS. IN ORDER TO TELL IF THE ENGINE HAS STEEL SLEEVES, CLEAN OFF THE TOP OF THE ENGINE BLOCK. IF THERE IS A DARK RING AROUND EACH CYLINDER, THERE IS A STEEL SLEEVE. IF NOT, IT IS AN ALUMINUM CYLINDER.

WORD GUIDE

CLEARANCE - DISTANCE BETWEEN TWO PLUGS OR POINTS

MINIMUM - LOWEST POSSIBLE AMOUNT

EXPAND - GET LARGER; GROW

INFORMATION

TO FIND OUT MORE ABOUT CYLINDERS, READ B & S REPAIR MANUAL IV, SECTION 9, PAGES 1-4, AND SECTION 11, PAGES 1 AND 2.

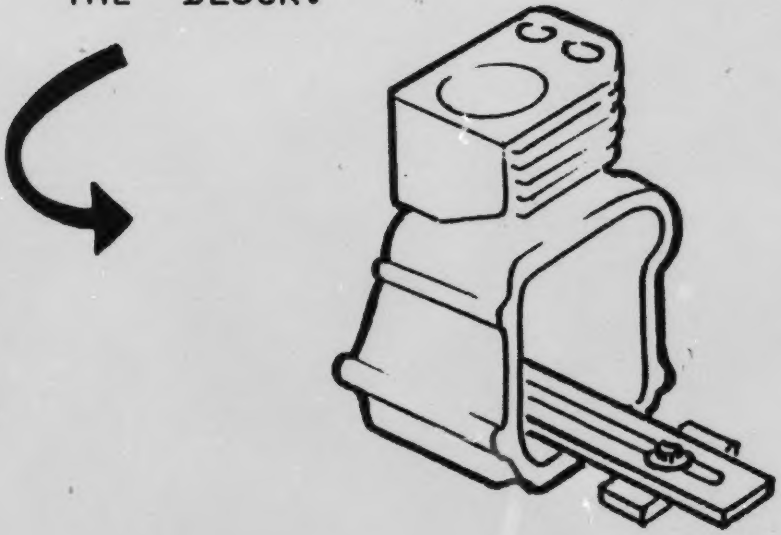
AFTER YOU HAVE READ ABOUT CYLINDERS IN THE B & S MANUAL, CHECK THE END GAP IN THE ENGINE TO BE SURE YOU HAVE ENOUGH MINIMUM CLEARANCE BETWEEN THE ENDS OF THE RINGS. IF THERE IS TOO MUCH CLEARANCE, THE RING WILL EXPAND TOO MUCH, AND MAKE A POOR SEAL. IF THERE ISN'T ENOUGH, THE ENDS OF THE RINGS MAY BUTT TOGETHER AND BREAK.

JOB STEPS

1. BE SURE YOU WEAR SAFETY GLASSES DURING ALL THESE STEPS.

2. TAKE ALL EQUIPMENT TO YOUR WORK AREA.

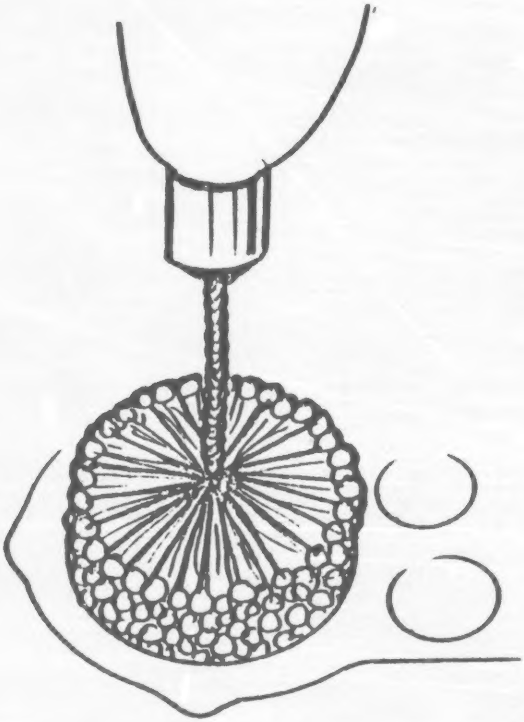
3. CLAMP THE BLOCK DOWN TO THE BENCH. BE SURE TO CLAMP IT WHERE YOU WON'T CRACK THE BLOCK.



4. INSTALL THE DEGLAZING HONE IN THE CHUCK OF THE 3/8" DRILL. DO NOT PLUG IN.

JOB STEPS

5. PLACE THE HONE IN THE CYLINDER AND MOVE THE HONE UP AND DOWN A COUPLE OF TIMES. CHECK TO SEE THAT THE STONES DON'T GO OUT OF THE CYLINDER MORE THAN 1" AT TOP OR BOTTOM.



JOB STEPS

6. LUBRICATE THE CYLINDER. IF THE CYLINDER IS ALUMINUM, USE A LARD OIL SUCH AS MAZOLA, WESSON, OR CRISCO OIL. IF THERE IS A CAST IRON OR STEEL SLEEVE, YOU CAN USE OLEUM, KEROSENE, OR A COMMERCIAL HONING OIL.

7. NOW, MAKE SURE THE TRIGGER ISN'T LOCKED ON THE DRILL AND THEN PLUG IN THE DRILL.

8. USING SLOW, UP-AND-DOWN STROKES, TURN ON THE DRILL. BE CAREFUL THAT THE HONE DOES NOT GO TOO FAR ON THE DOWN STROKE AND BE SURE IT DOES NOT COME OUT TOO FAR ON THE OUT-STROKE.

   REMINDER: WORK SAFELY.

9. CHECK THE CYLINDER OFTEN, UNTIL MOST OF THE GLAZE IS GONE. REMEMBER TO SHUT OFF THE DRILL BEFORE REMOVING THE HONE FROM THE CYLINDER.

JOB STEPS

10. WHEN MOST OF THE GLAZE IS GONE, CLEAN THE BLOCK AND CYLINDER WITH OLEUM OR SOAP AND WATER. CAUTION: CYLINDER MUST BE COMPLETELY CLEANED OF GRIT.

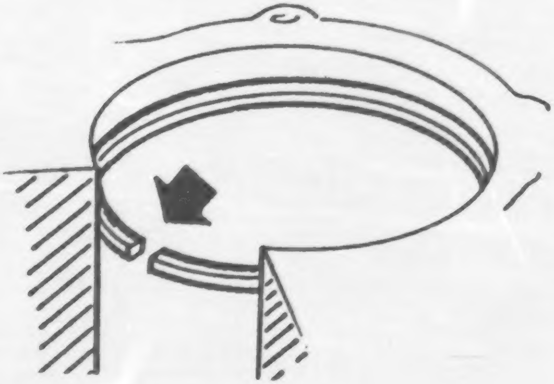
    NOTE: IF YOU USE SOAP AND WATER TO CLEAN A CYLINDER AFTER DEGLAZING, YOU WILL HAVE TO DRY IT OFF. OIL THE CYLINDER WITH A LOT OF 30W CYLINDER OIL. THIS WILL PREVENT RUST.

11. SHOW THE CYLINDER TO YOUR INSTRUCTOR. HE/SHE WILL ASK YOU QUESTIONS.

12. PUT RINGS INTO THE CYLINDER. THEN, PUSH THE RINGS DOWN INTO THE CYLINDER TO THE BOTTOM OF THE RING TRAVEL.

JOB STEPS

13. NOW, CHECK THE RING END GAP. LOOK UP INFORMATION ON RING GAP IN THE MANUAL. IF THERE ISN'T A MANUAL AVAILABLE, A GOOD RULE OF THE THUMB WOULD BE TO FIGURE .003 MINIMUM END-GAP PER INCH OF DIAMETER OF THE RING SAMPLE. (2 INCH RING = .006 GAP, 2 1/2" RING = .009, 3" RING = .009)



14. SHOW YOUR INSTRUCTOR THE END GAP. IF IT IS NOT OK, THE INSTRUCTOR WILL HELP YOU.

small engine repair

unit: RINGS

capital area career center

module: 7501 23 004 7 date: 3/77 level: I

skill title: USING A PISTON RING COMPRESSOR AND SPACING THE RING END GAPS

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

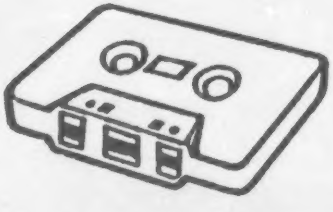
HOW TO USE A PISTON RING COMPRESSOR AND HOW TO PROPERLY SPACE THE RING ENDS ON THE PISTON.

AND IN ORDER TO DO THIS YOU WILL NEED:

A PISTON WITH RINGS
A BLOCK
A RING COMPRESSOR

WE WILL KNOW YOU CAN DO IT WHEN:

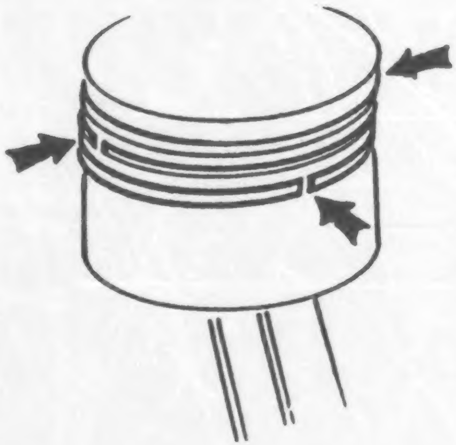
YOU HAVE INSTALLED THE PISTON AND RINGS INTO THE CYLINDER WITH THE RING ENDS STAGGERED.

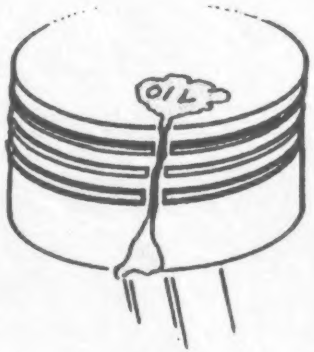


A TAPE OF THIS MODULE IS AVAILABLE.

INFORMATION

WHEN YOU INSTALL THE PISTON RINGS ON THE PISTON, YOU MUST BE SURE THAT THE RING END GAPS ARE STAGGERED BEFORE YOU PUT THE RING COMPRESSOR ON THE PISTON.





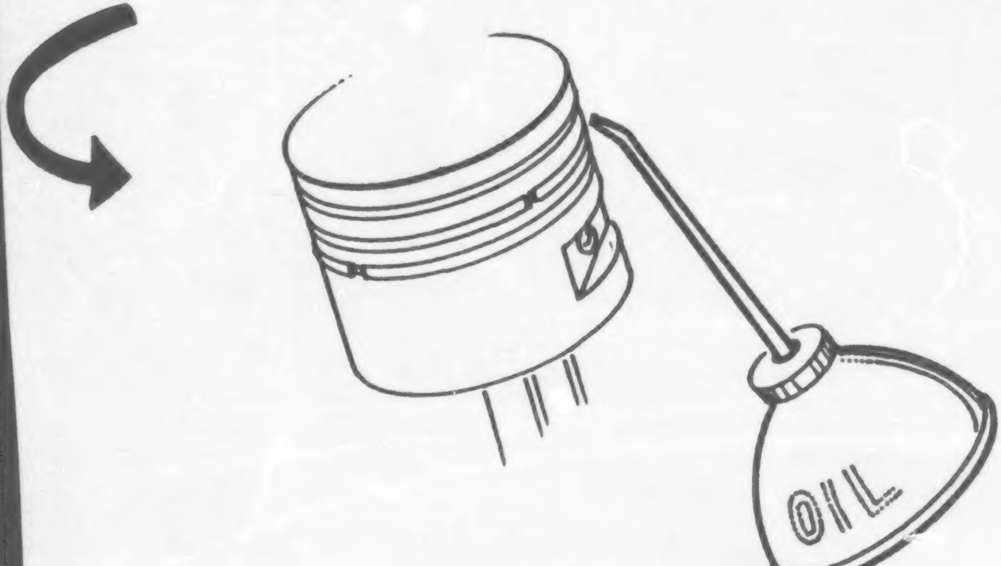
IF THE RING END GAPS ARE LINED UP, THEY WILL LEAK COMPRESSION AND THE ENGINE MAY NOT RUN OR MAY BURN A LOT OF OIL.

JOB STEPS

1. GET YOUR EQUIPMENT AND GO TO THE WORK AREA.

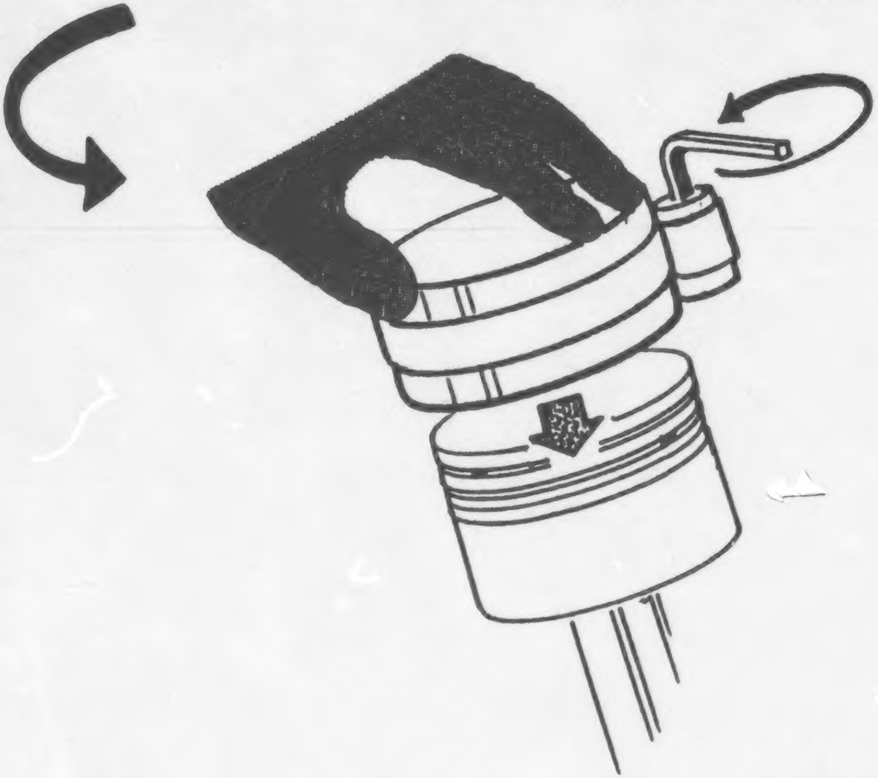
2. PUT THE ROD AND PISTON IN A VISE (CLAMP VERY LIGHTLY ON THE ROD).

3. NOW, STAGGER THE RING END GAPS AND LIGHTLY COAT THE PISTON AND RINGS WITH OIL.



JOB STEPS

4. USING THE RING COMPRESSOR HANDLE, OPEN IT UP SO THAT THE COMPRESSOR WILL SLIDE OVER THE PISTON AND RINGS.

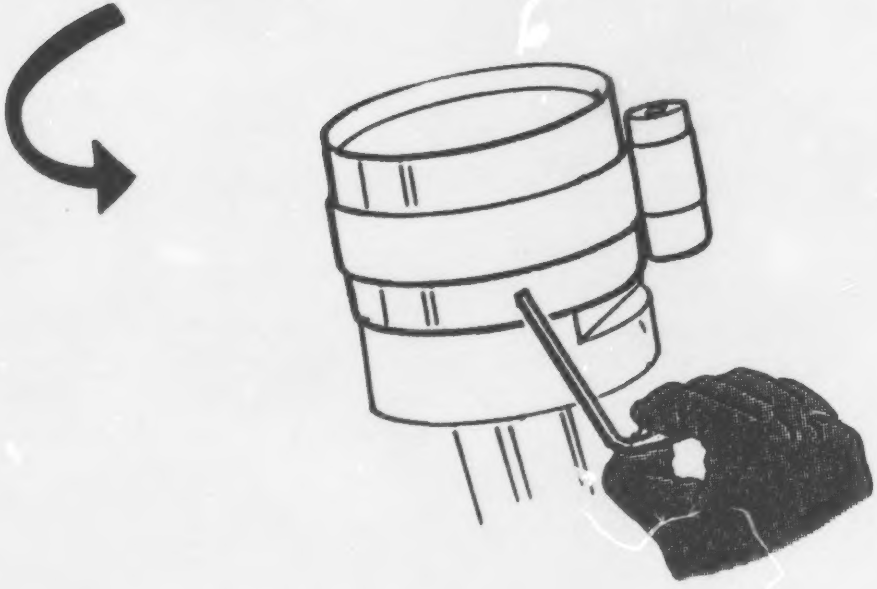


5. LEAVE THE RING COMPRESSOR UP FROM THE BOTTOM OF THE PISTON ABOUT 1/2 INCH.

JOB STEPS

6. TIGHTEN THE COMPRESSOR LIGHTLY.

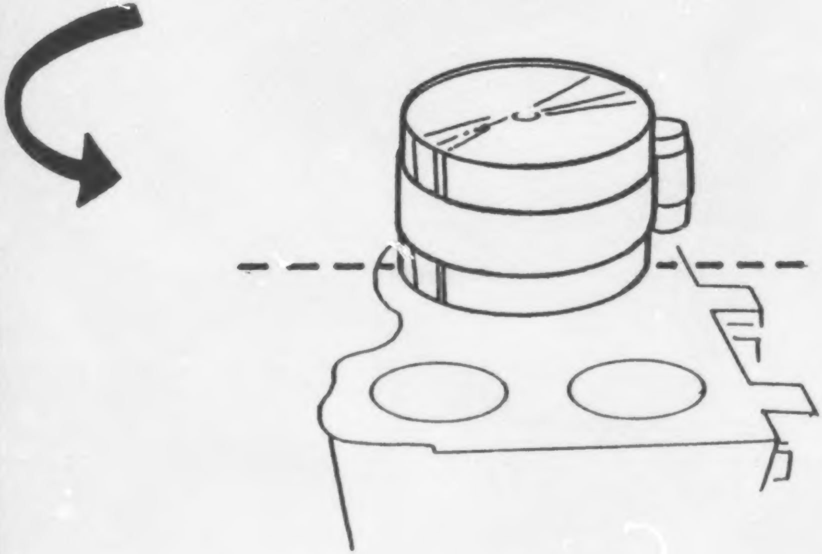
7. NOW, TAP LIGHTLY ON THE SIDE OF THE RING COMPRESSOR. (THIS WILL SEAT THE RINGS IN THE GROOVES.) USE THE COMPRESSOR HANDLE WITH WHICH TO TAP WHERE THE RINGS ARE IN THE GROOVES.



JOB STEPS

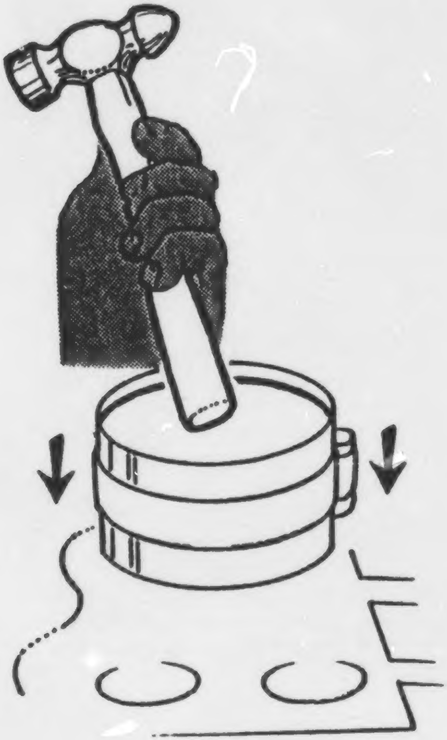
8. REMOVE THE PISTON AND ROD FROM THE VISE.

9. INSERT THE PISTON AND ROD INTO THE CYLINDER UNTIL THE COMPRESSOR IS RESTING ON THE CYLINDER.



JOB STEPS

10. NOW, USING A WOODEN HAMMER HANDLE, GENTLY TAP THE PISTON DOWN INTO THE CYLINDER.



small engine repair

unit:

capital area career center

module: 7501 23 010 7 date: 4/77 level: II

skill title: HOW TO SERVICE PISTONS AND RINGS

developed & written by: DON FOSTER AND DWIGHT SMITH

visuals by: DAVE WEHRWEIN

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO SERVICE PISTONS AND RINGS.

AND IN ORDER TO DO THIS YOU WILL NEED:

A 2 OR 4 CYCLE ENGINE

SOCKET SET

SCREWDRIVER SET

SEAL

GASKET KIT

LUBRIPLATE

RUBBER MALLET

MICROMETER

RING GROOVE CLEANER

FEELER GAUGE

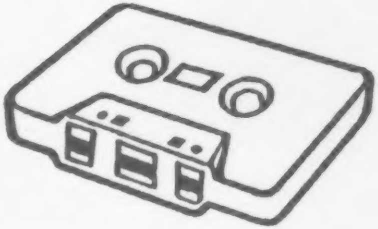
WORK BENCH

PISTON RING COMPRESSOR

SAFETY GLASSES

WE WILL KNOW THAT YOU CAN DO IT WHEN:

YOU HAVE DONE A RING JOB ON AN ENGINE, ASSEMBLED THE ENGINE, ACCORDING TO MANUAL SPECIFICATIONS, AND CAN RUN THE ENGINE.



A TAPE OF THIS MODULE IS AVAILABLE

CAUTION: BEFORE YOU USE ANY TOOLS, ESPECIALLY ELECTRIC, BE SURE THAT YOUR INSTRUCTOR OR ANOTHER STUDENT IS THERE TO HELP YOU. WEAR YOUR SAFETY GLASSES.

WORD GUIDE

CAM GROUND - A PISTON THAT IS WIDER ONE WAY THAN THE OTHER.

INFORMATION

WHY DO YOU NEED TO REPLACE RINGS ON ENGINES?

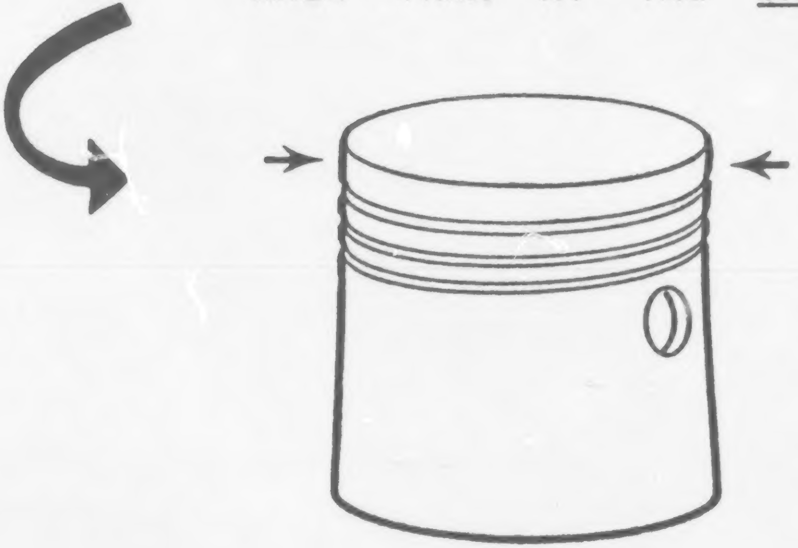
WHEN AN ENGINE STARTS TO BURN AND LOSE OIL, IT IS OFTEN BECAUSE THE RINGS ARE WORN OUT. WITH NEW RINGS AN OLD ENGINE CAN RUN SMOOTHLY AGAIN.

RINGS ARE PARTS OF PISTONS. NOT ALL PISTONS ARE PERFECTLY ROUND. SOME ARE CAM GROUND. THIS MEANS THEY ARE WIDER AT ONE END THAN AT THE OTHER. THE WIDEST SIDE IS OPPOSITE THE WRIST PIN HOLES.

INFORMATION

NOTE: THE REASON A PISTON IS CAM GROUND IS BECAUSE A CAM GROUND PISTON WILL FIT MORE UNIFORMLY IN THE SKIRT WHEN IT GETS HOT AND EXPANDS.

NOTE: THE PISTON IS USUALLY SMALLER IN DIAMETER AT THE RING LOAD AREA THAN AT THE SKIRT AREA.



Cam Ground Piston

INFORMATION

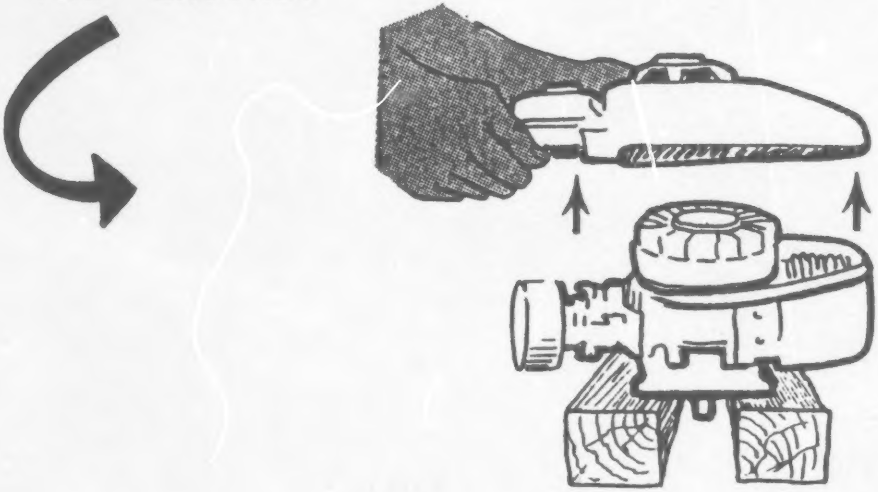
READ PAGE 3 OF MOD 7501 23 002 TO LEARN MORE ABOUT PISTONS AND PISTON RINGS.

ALSO READ SECTION 9 OF THE BRIGGS AND STRATTON MANUAL IV.

JOB STEPS

1. GET THE ENGINE ON WHICH YOU WILL WORK. PUT IT ON THE WORK BENCH.

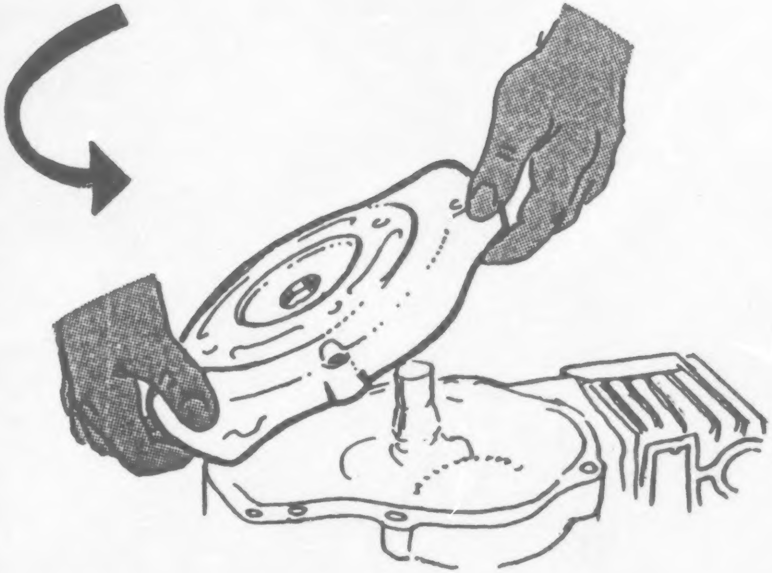
2. TAKE THE HEAD AND AIR-HOUSING OFF THE ENGINE.

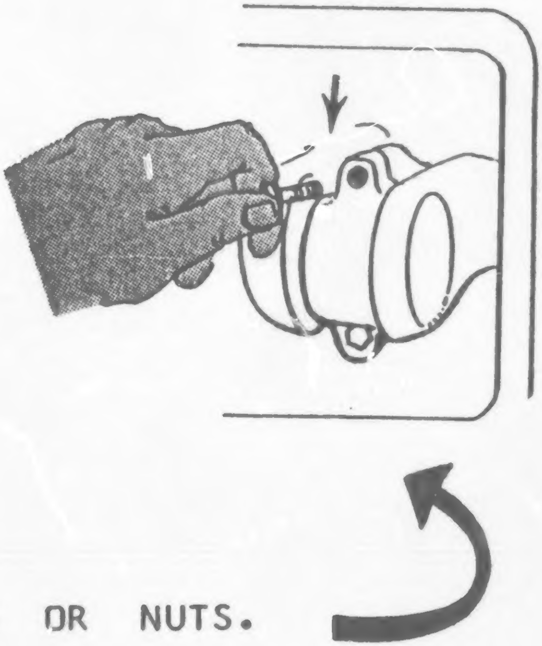


3. DRAIN THE OIL OUT OF THE CRANKCASE.

JOB STEPS

4. TAKE THE SUMP OFF THE ENGINE.



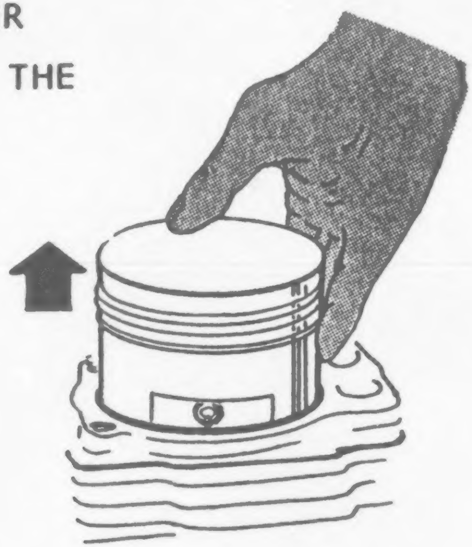


5. TAKE OFF THE ROD BOLTS OR NUTS.

JOB STEPS

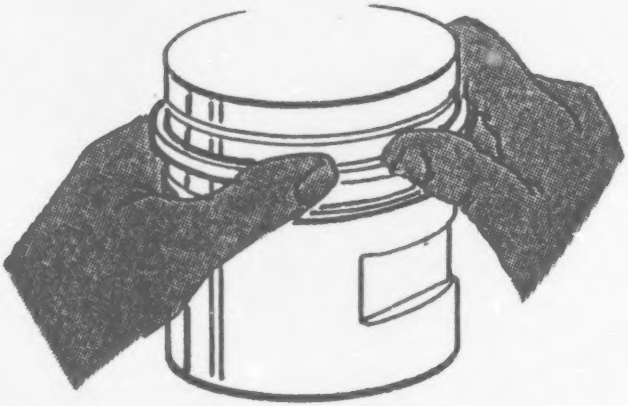
6. LOOK AT THE ROD AND CRANKSHAFT. NOTICE HOW THE ROD IS ATTACHED TO THE CRANKSHAFT. THEN, TAKE THE ROD AND PISTON OUT OF THE BLOCK.

NOTE: THE PISTON AND ROD MUST COME OUT OF THE TOP OF THE CYLINDER. PUSH UP WITH ONE HAND AND HOLD THE PISTON WITH THE OTHER TO AVOID SCRATCHING THE CYLINDER AND PISTON.



JOB STEPS

7. SERVICE THE PISTON RINGS LIKE YOU DID IN MOD 7501 23 001, (HOW TO REMOVE AND REPLACE PISTON RINGS). BE SURE TO REMOVE THE RINGS TOWARD THE TOP OF THE PISTON. DO NOT PUT THE RINGS ON YET.



WORD GUIDE

WEAR - DECAY BECAUSE OF EXTRA USE.

JOB STEPS

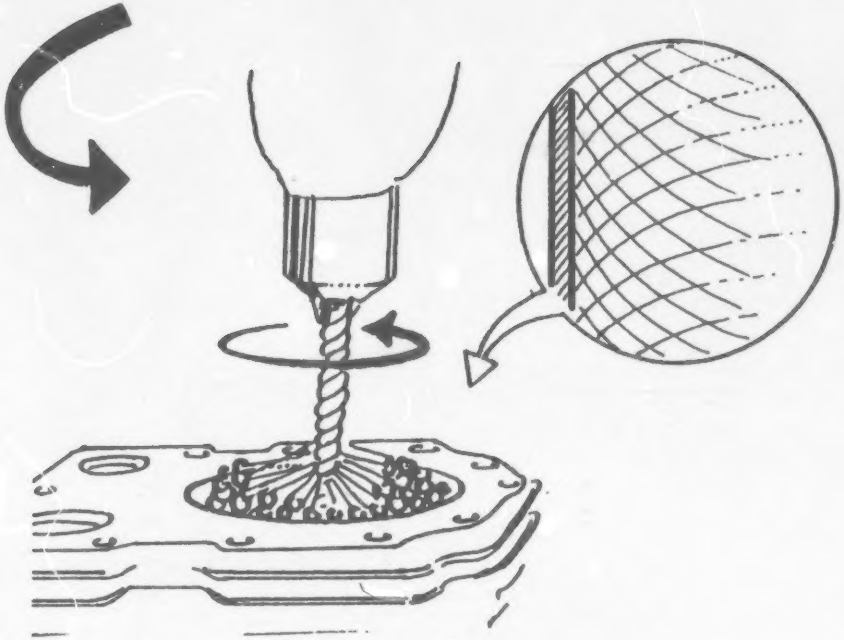
8. CHECK THE CYLINDER FOR WEAR AND DAMAGE. LOOK FOR SCORING, (DEEP LINES OR GROOVES WHERE THERE SHOULDN'T BE ANY) AND OTHER WEAR.

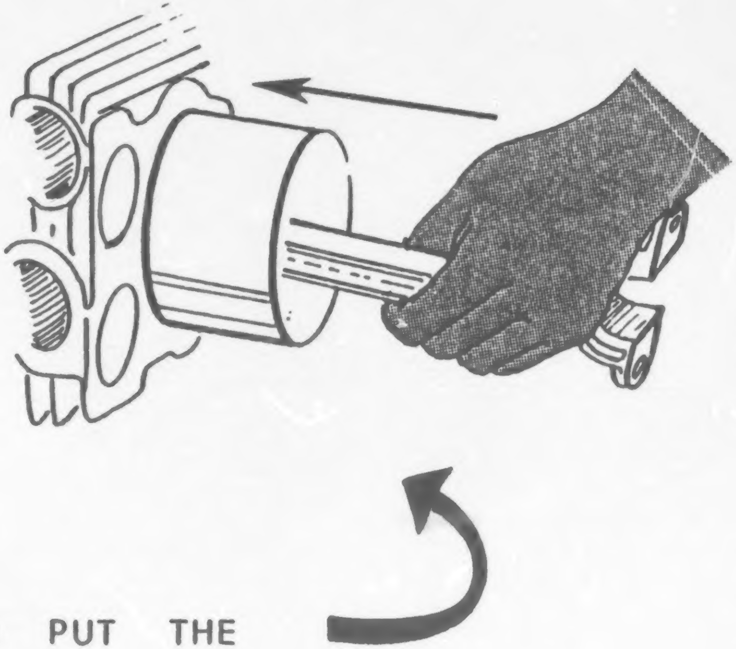
   NOTE: ON CHROME-PLATED CYLINDERS, CHECK FOR CHROME PEELING OFF THE CYLINDERS. ON ALUMINUM CYLINDERS, CHECK FOR GALLING, (GALLING LOOKS LIKE A WELD ON THE PISTON, AND LIKE A RIP IN THE CYLINDER).

9. READ BRIGGS AND STRATTON MANUAL FOR PISTON SKIRT CLEARANCES FOR THIS ENGINE. LOOK AT THE PICTURE OF THE PISTON IN THIS MOD.

JOB STEPS

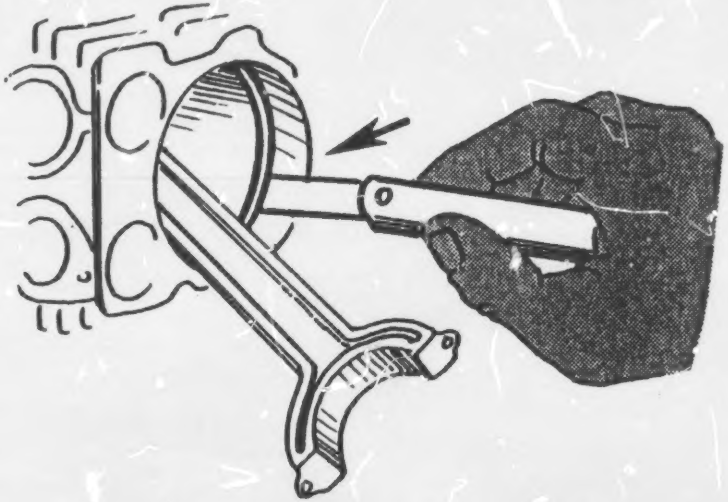
10. DEGLAZE THE CYLINDER. REFER TO MOD 7511 01 010.

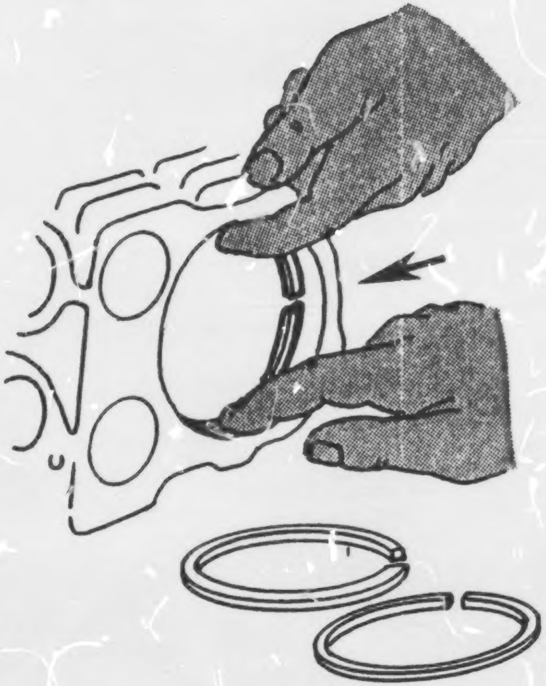




11. HOLD ONTO THE ROD END AND PUT THE PISTON INTO THE CYLINDER.

12. USING THE PROPER FEELER GAUGE, CHECK THE CLEARANCE ON SIDE OF THE PISTON OPPOSITE THE WRIST PIN HOLES.



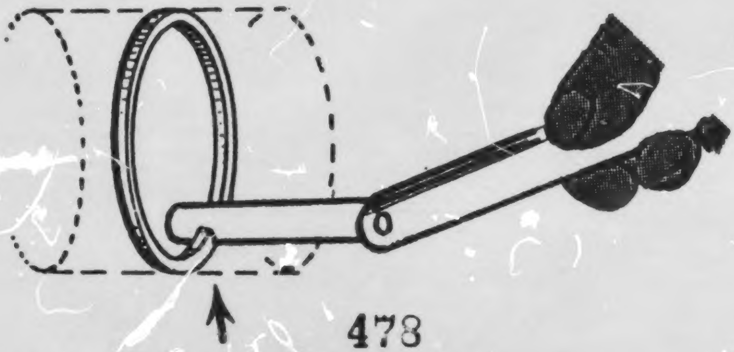


13. IF THE PISTON MEETS SPECIFICATIONS IN THE MANUAL, CAREFULLY PUT THE RINGS INTO THE CYLINDER.

JOB STEPS

14. USING THE TOP OF THE PISTON, PUSH THE RINGS DOWN TO THE BOTTOM OF THE RING TRAVEL.

15. CHECK THE RING END GAP. LOOK UP THE GAP IN THE MANUAL. IF YOU DO NOT HAVE A MANUAL WITH THIS INFORMATION, HERE IS A RULE OF THUMB: .003 MINIMUM END GAP PER 1" OF CYLINDER BORE. WITH THIS, YOU CAN SEE THAT A 2" CYLINDER HAS A .006 RING END GAP, A 2½" CYLINDER HAS A .0075 RING END GAP, AND A 3" CYLINDER HAS A .009 RING END GAP.

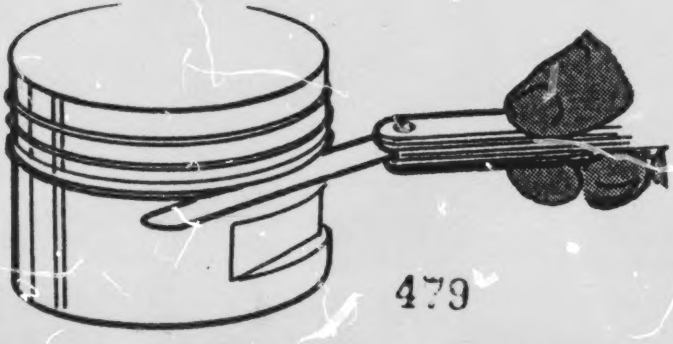


JOB STEPS

16. IF THE RING END GAP IS CORRECT, PULL THE RINGS OUT OF THE CYLINDER.

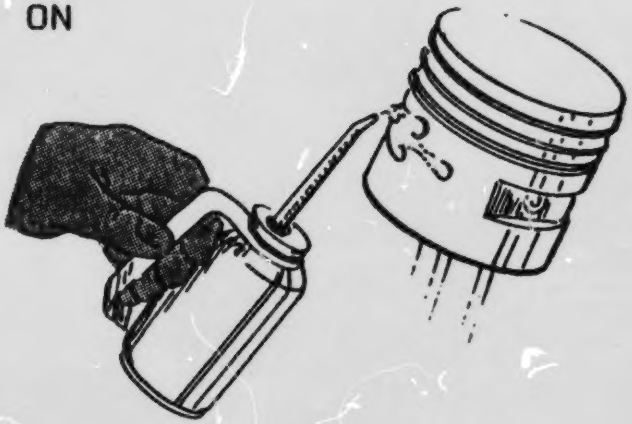
17. PUT THE RINGS ON THE PISTON, LIKE YOU DID IN MOD 7501 23 001. (READ SECTION 9, PAGE 2 OF REPAIR MANUAL IV.

18. USING A FEELER GAUGE, CHECK THE PISTON RING LOAD CLEARANCE. THIS IS THE DISTANCE BETWEEN THE RING AND THE RING LOAD. CHECK THE MANUAL OR YOUR INSTRUCTOR FOR THE MINIMUM AND MAXIMUM CLEARANCES.

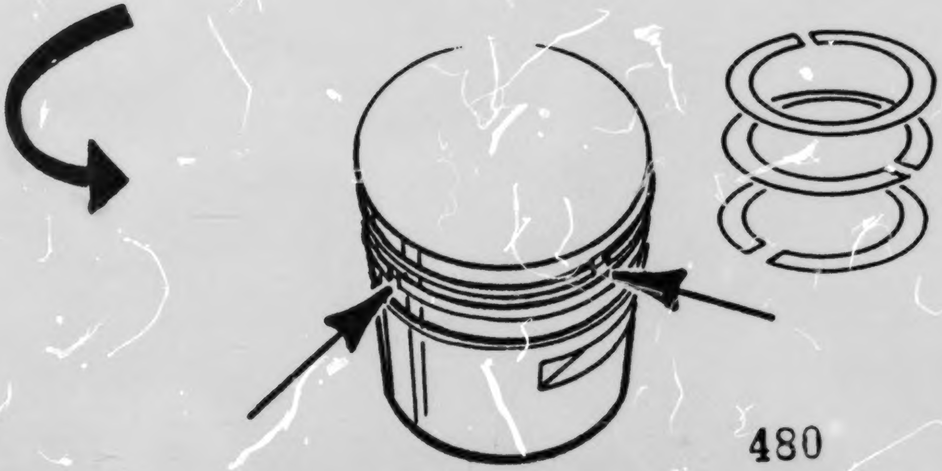


JOB STEPS

19. IF THE PISTON IS OK, PUT A LIGHT COAT OF MOTOR OIL ON THE RINGS AND THE PISTON SKIRT.

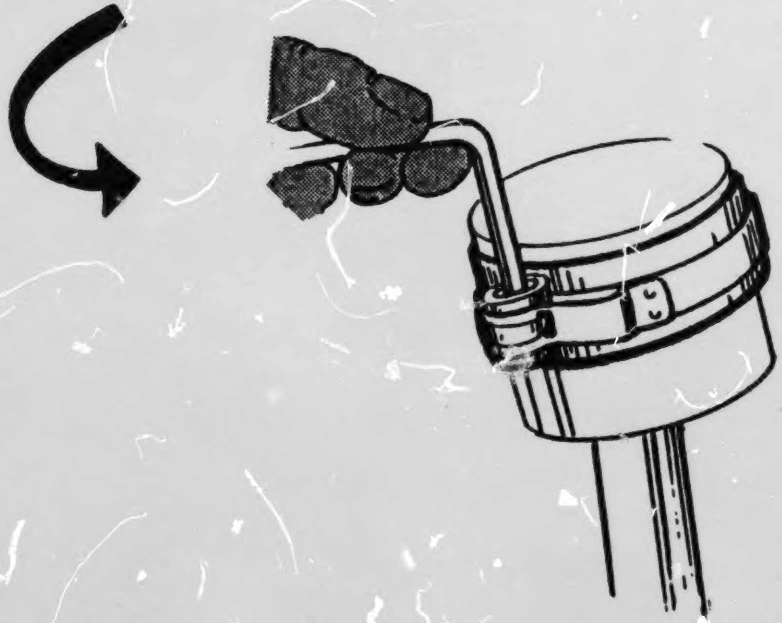


20. CHECK TO SEE THAT THE RING GAPS ARE ON DIFFERENT SIDES OF THE PISTON.



JOB STEPS

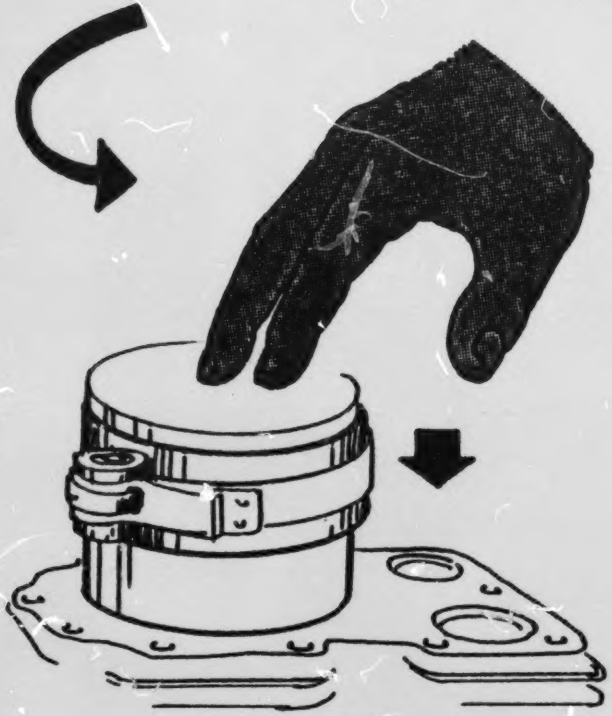
21. PUT THE PISTON RING COMPRESSOR ON THE PISTON. THE ROD MUST BE POINTED DOWN. REFER TO MANUAL IV, PAGES 3 AND 4 OF SECTION 9.

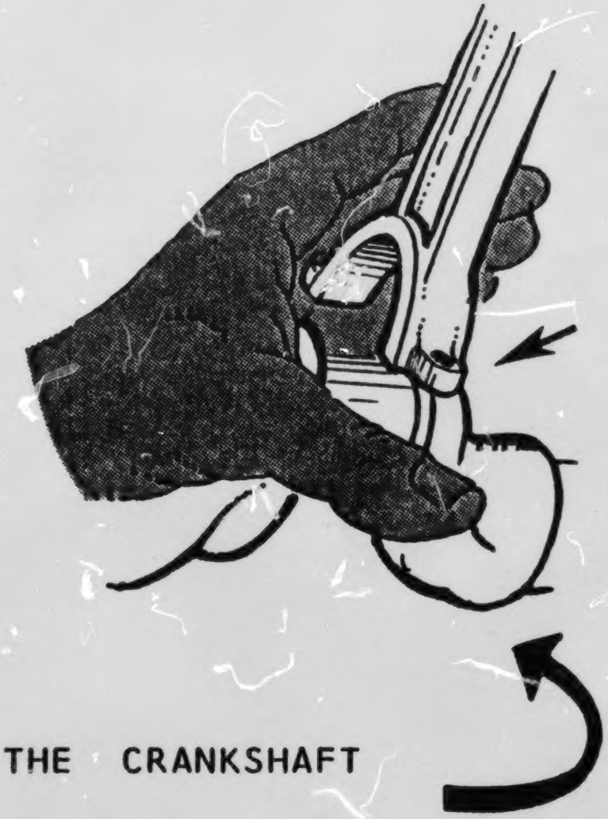


22. PUT THE PISTON AND ROD INTO THE CYLINDER. BE SURE TO HAVE THE ROD FACING THE RIGHT WAY.

JOB STEPS

23. GENTLY PUSH THE PISTON AND ROD DOWN INTO THE CYLINDER. BE CAREFUL NOT TO SCRATCH THE CYLINDER WALLS.

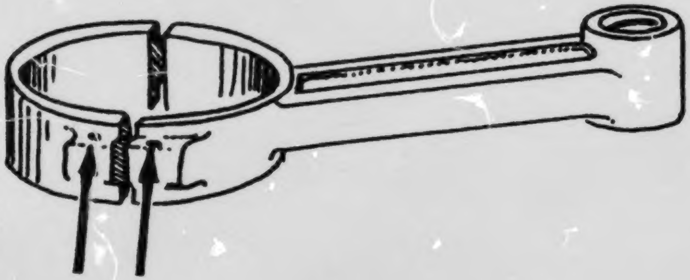




24. GUIDE THE ROD ONTO THE CRANKSHAFT THROW.

JOB STEPS

25. MATCH UP THE MARKS ON THE ROD CAP. IF THERE IS AN OIL SPLASHER, BE SURE TO PUT IT ON BEFORE THE BOLTS OR NUTS.

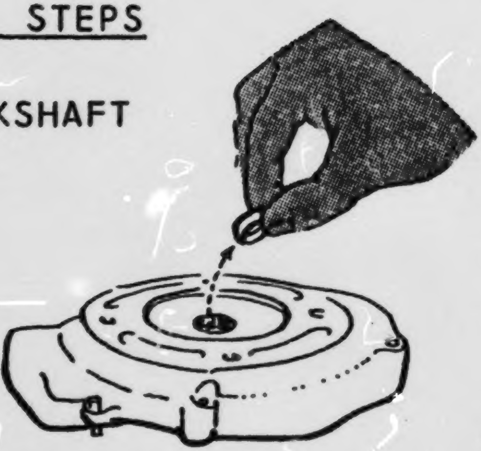


26. TORQUE THE BOLTS OR NUTS TO SPECIFICATIONS. (SEE THE MANUAL) BEND THE ROD LOCK TO THE BOLT HEAD OR NUT.

27. IF YOU TOOK THE CAMSHAFT OUT, PUT IT BACK IN. BE SURE TO ALIGN THE TIMING MARKS, INSTALL THE LIFTERS, AND RETIME THE CAM TO THE CRANK.

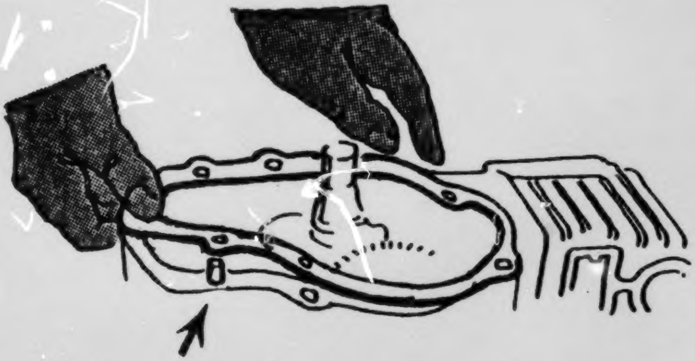
JOB STEPS

28. REMOVE THE CRANKSHAFT SEAL FROM THE ENGINE SUMP.



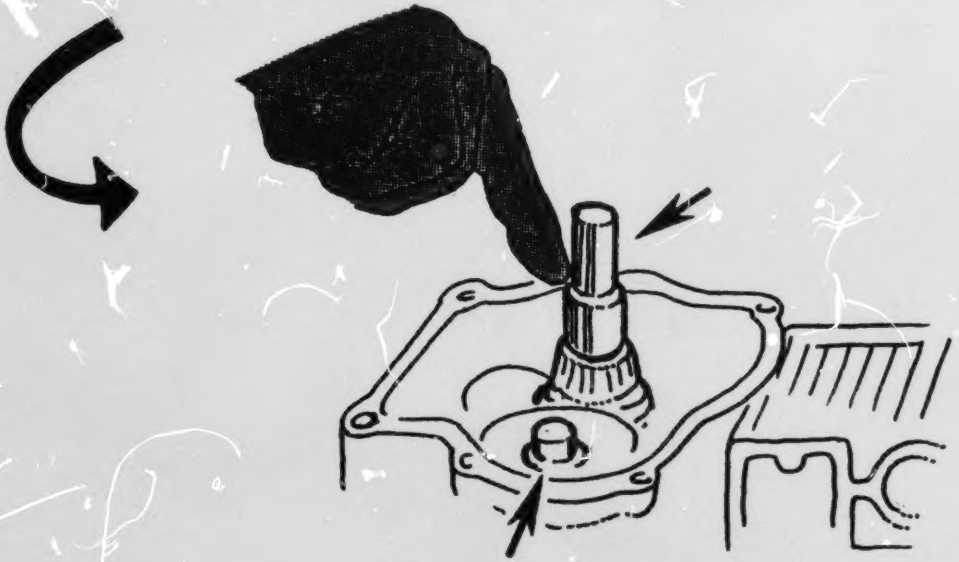
29. CLEAN THE SUMP. GET IT VERY CLEAN FOR ASSEMBLY.

30. PUT THE NEW GASKET ON THE BLOCK. IF THE GASKET IS WRINKLED, SOAK IT IN WARM WATER FOR A MINUTE OR SO. BE SURE THE DOWEL PINS ARE IN THE RIGHT PLACE TO HOLD THE GASKET.



JOB STEPS

31. PUT LUBRIPLATE ON THE CAMSHAFT AND CRANKSHAFT BEARING-SURFACES.



32. IF THE ENGINE HAS AN OIL SLINGER OR A GOVERNOR PUT IT ON.

33. PUT THE SUMP ON THE CRANKSHAFT. ALIGN THE CAMSHAFT WITH THE BEARING HOLE. DO NOT FORCE THE SUMP DOWN.

NOTE: IF THE ENGINE IS A TECUMSEH AND HAS A MECHANICAL GOVERNOR, BE

JOB STEPS

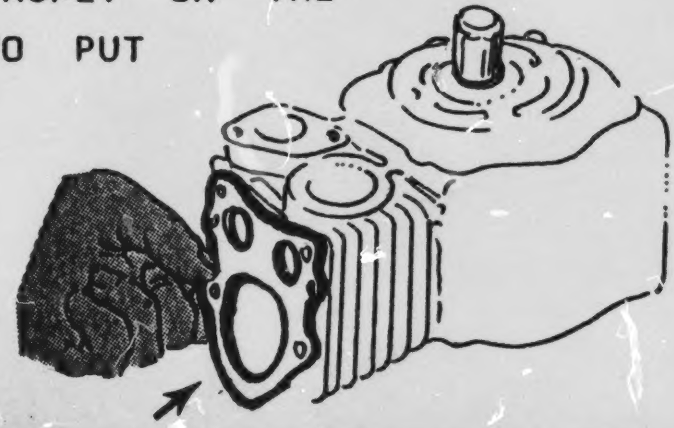
SURE THE NYLON GOVERNOR GEAR IS MESHED WITH THE CAM GEAR. IF NOT, TURN THE CRANKSHAFT BACK AND FORTH.

34. GENTLY PUSH THE SUMP THE REST OF THE WAY DOWN.

35. PUT THE SUMP BOLTS IN. TORQUE THEM TO THE SETTING IN THE MANUAL.

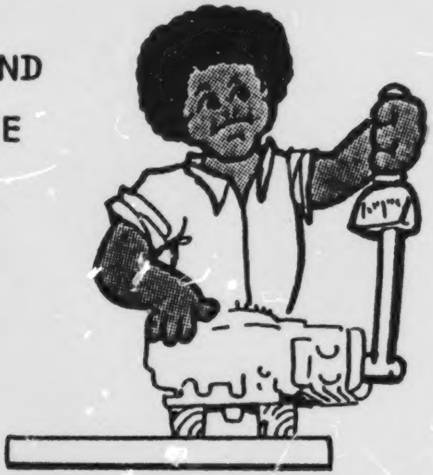
36. PUT A NEW OIL SEAL INTO THE SUMP. REFER TO MOD 7501 01 001.

37. PUT A NEW HEAD GASKET ON THE ENGINE. BE SURE TO PUT IT ON CORRECTLY.



JOB STEPS

38. PUT THE HEAD ON AND TORQUE IT DOWN. SEE MANUAL FOR SETTING.



39. PUT THE AIR-HOUSING ON THE ENGINE.

40. FILL THE ENGINE WITH OIL AND GAS.

41. START THE ENGINE AND ADJUST IT.

42. CHECK THE ENGINE FOR OIL LEAKS. SHUT IT OFF.

43. TORQUE THE CYLINDER HEAD BOLTS AGAIN.

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JOB STEPS

44. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

GOOD JOB. YOU HAVE SERVICED THE RINGS ON A SMALL ENGINE!

small engine repair

unit: VALVES

capital area career center

module: 7501 24 001 7 **date:** 3/77 **level:** I

skill title: REMOVE AND REPLACE A VALVE CHAMBER BREATHER OR COVER

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

PERFORMANCE OJBECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE AND REPLACE THE VALVE CHAMBER BREATHER OR COVER.

AND IN ORDER TO DO THIS YOU WILL NEED:

A CUT-AWAY BRIGGS AND STRATTON ENGINE

A TORQUE WRENCH

A SOCKET SET

WORD GUIDE

SPECIFICATIONS - REQUIRED SETTING OR ADJUSTMENTS. THE ENGINE MAKER USUALLY PRINTS THESE IN A MANUAL OR INSTRUCTION BOOK.

WE WILL KNOW YOU CAN DO IT WHEN:

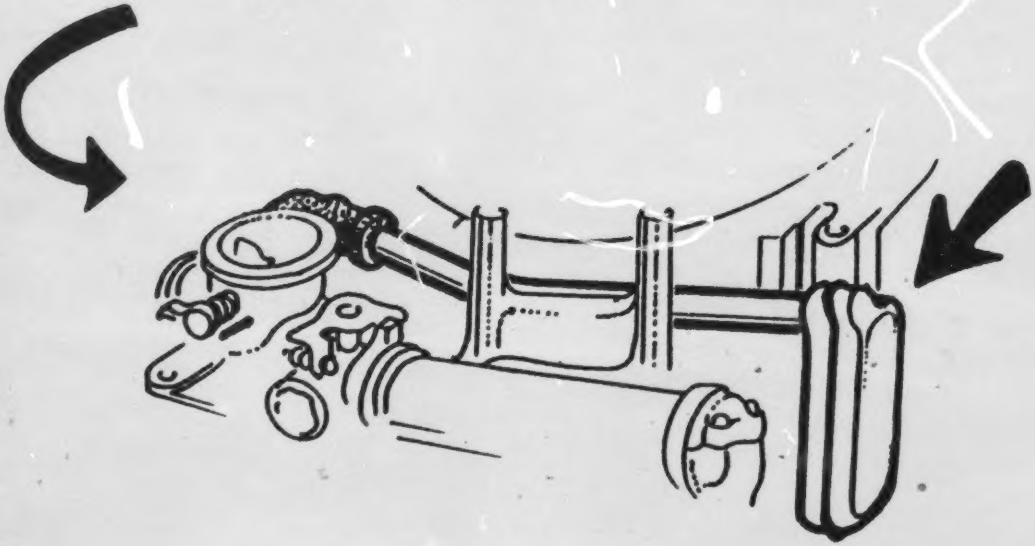
YOU HAVE TAKEN OFF AND PUT BACK ON A VALVE CHAMBER OR COVER WITH THE SMALL HOLES IN THE CORRECT POSITION AND THE BOLTS ARE TORQUED TO SPECIFICATIONS.

A TAPE OF THIS MODULE IS AVAILABLE.

JOB STEPS

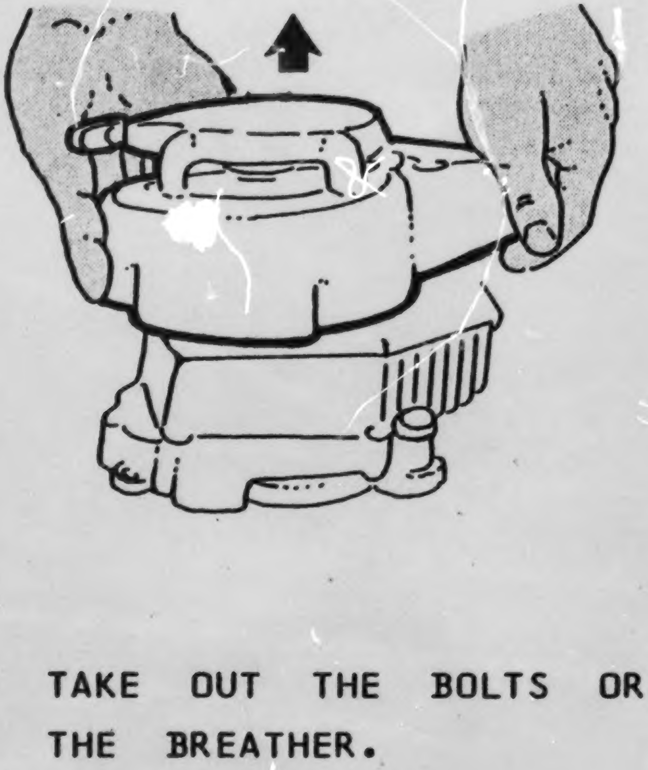
1. FIND THE VALVE BREATHER ON THE CUT-AWAY ENGINE.

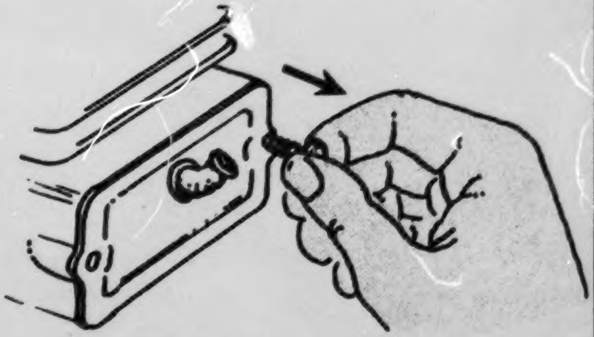
NOTE: MOST BREATHERS ARE UNDER THE CARBURETOR OR MANIFOLD. IN SOME BRIGGS AND STRATTON ENGINES, THE BREATHER IS ON THE SIDE OPPOSITE THE CARBURETOR.



JOB STEPS

2. IF THE CARBURETOR IS IN THE WAY, TAKE IT OFF AS YOU DID IN MOD 7501 05 005.

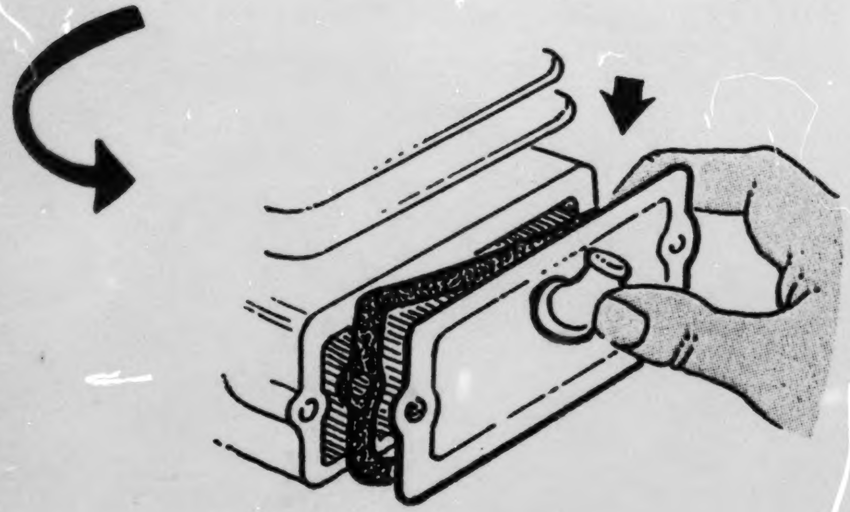




3. TAKE OUT THE BOLTS OR SCREWS WHICH HOLD THE BREATHER.

JOB STEPS

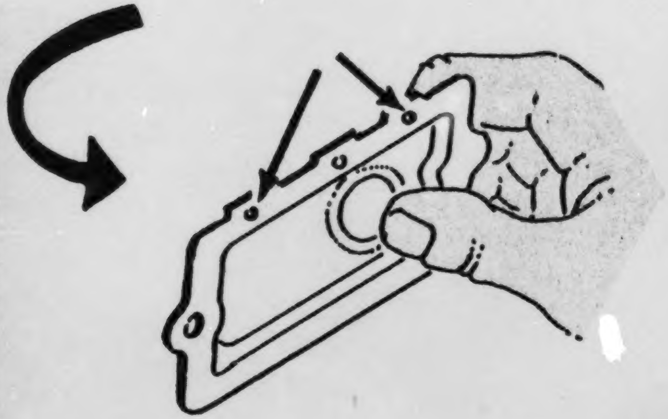
4. TAKE OFF THE VALVE BREATHER OR COVER.

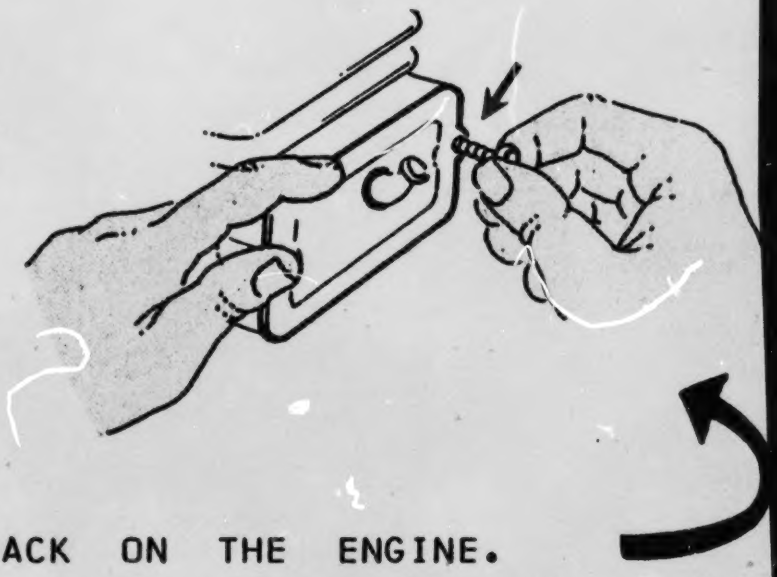


5. LOOK AT THE VALVE BREATHER OR COVER. NOTE THE WAY IT CAME OFF. IT MUST BE PUT BACK THE CORRECT WAY OR THE ENGINE WILL BURN OR LEAK OIL.

JOB STEPS

6. CHECK VALVE BREATHER OR COVER FOR THE SMALL HOLES. THESE HOLES ALLOW OIL TO RUN DOWN INTO THE CRANKCASE. FACE THE HOLES DOWN WHEN YOU PUT THE COVER BACK ON.





7. PUT THE BREATHER BACK ON THE ENGINE. BE SURE TO PUT IT ON THE CORRECT WAY.

JOB STEPS

8. TORQUE THE BOLTS TO THE SPECIFICATIONS. ASK YOUR INSTRUCTOR FOR THE TORQUE SPECIFICATIONS.

9. SHOW YOUR INSTRUCTOR THAT YOU CAN REMOVE AND REPLACE THE VALVE BREATHER OR COVER.

JOB STEPS

44. ASK YOUR INSTRUCTOR TO CHECK YOUR WORK.

GOOD JOB. YOU HAVE SERVICED THE RINGS ON A SMALL ENGINE!

small engine repair

unit: ENGINE BLOCK

capital area career center

module: 7501 24 007 7 date: 4/77 level:

skill title: REMOVE AND REPLACE VALVE GUIDES IN CAST IRON BRIGGS AND STRATTON ENGINE

developed & written by: DON FOSTER

visuals by: DAVE WEHRWEIN

WORD GUIDE

OPERATE - RUN; WORK

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO REMOVE WORN VALVE GUIDES AND REPLACE AND REAM GUIDES IN A CAST-IRON BRIGGS & STRATTON ENGINE.

IN ORDER TO DO THIS YOU WILL NEED:

A FOUR CYCLE ENGINE BLOCK
VALVE GUIDE REAMER
REPLACEMENT VALVE GUIDE
TOOLS (FACTORY SPECIAL)

WE WILL KNOW YOU CAN DO IT WHEN:

AFTER YOU HAVE WORKED ON THE VALVES, YOUR ENGINE OPERATES ACCORDING TO SERVICE MANUAL SPECIFICATIONS.

A TAPE OF THIS MODULE IS AVAILABLE.

WORD GUIDE

NOMENCLATURE - NAMES (OF SOMETHING)

INFORMATION

READ IN B & S REPAIR INSTRUCTIONS MANUAL IV, SECTION 6, REBUILDING VALVE GUIDES TO ORIGINAL DIAMETER, AND VALVE NOMENCLATURE AND CONSTRUCTION.

JOB STEPS

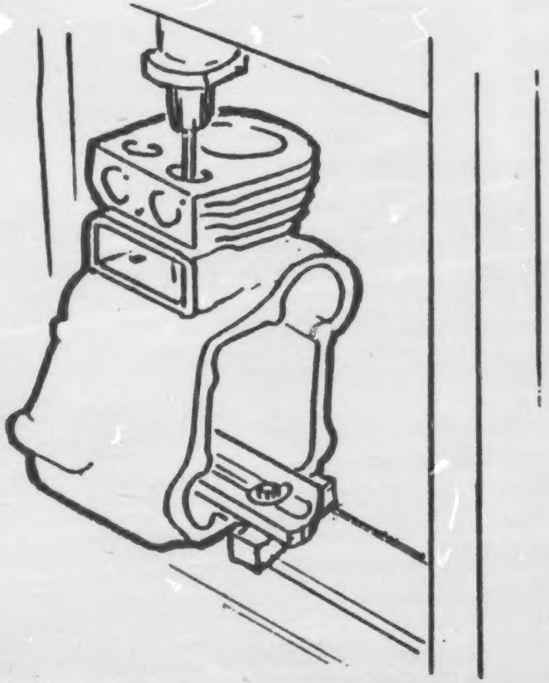
THINK SAFETY - WORK SAFELY

1. TAKE ALL EQUIPMENT TO YOUR WORK AREA.

2. CHECK PARTS MANUAL AND SERVICE SPECIFICATIONS FOR FACTS ON HOW TO REPLACE VALVE GUIDES. IF YOU DO NOT HAVE ANY GUIDES OR OVER-SIZE VALVES, BLOCK MUST BE SCRAPED.

3. USING THE PROPER VALVE GUIDE DRIVER, PLACE AND START PRESSING BLOCK IN ARBOR PRESS GUIDE FROM BLOCK (FROM TOP TO BOTTOM).

   NOTE: WATCH GUIDE THROUGH BREATHER CHAMBER AS IT IS PASSING DOWNWARD.

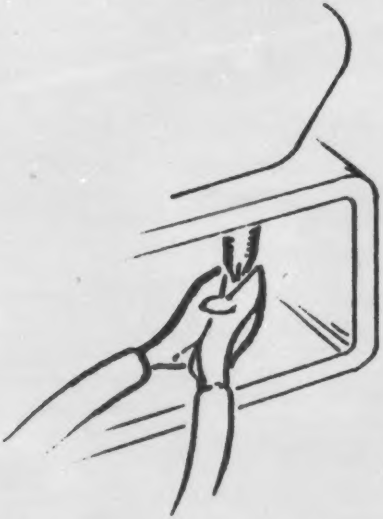


WORD GUIDE

DIAMETER - DISTANCE FROM, END TO END, OF A STRAIGHT LINE PASSING THROUGH THE CENTER OF A CIRCLE.

JOB STEPS

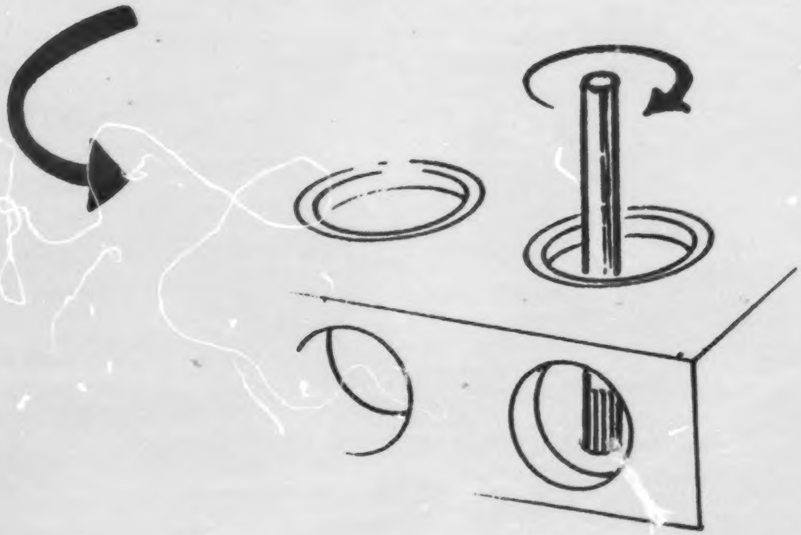
4. IF DIAMETER OF TAPPET HOLE IS SMALLER THAN LENGTH OF GUIDE, USE PLIERS TO BREAK OFF PORTIONS OF GUIDE BEFORE BOTTOMING OUT.



JOB STEPS

5. PLACE VALVE GUIDE IN BLOCK AND PRESS INTO PLACE (PREHEAT BLOCK TO 180° F. AND CHILL VALVE GUIDE TO AID YOU IN DOING THIS JOB.

6. CHOOSE PROPER REAMER AND REAM GUIDE TO FIT.



small engine repair

unit: OVERHAUL

capital area career center

module: 7501 25 001 7 **date:** 8/77 **level:** IV

skill title: HOW TO OVERHAUL AN AIR-COOLED ENGINE

developed & written by: JIM PITTS

visuals by:

PERFORMANCE OBJECTIVE

YOU ARE GOING TO LEARN:

HOW TO OVERHAUL AN AIR-COOLED ENGINE AND ESTIMATE THE COST FOR A CUSTOMER.

AND IN ORDER TO DO THIS YOU WILL NEED:

AN AIR-COOLED ENGINE AND HAND TOOLS

MERCOTRONIC TESTER

TORQUE WRENCH

SAFETY GLASSES

WE WILL KNOW YOU CAN DO IT WHEN:

THE ENGINE STARTS WITHIN 5 PULLS, IDLES AT THE PROPER SPEED, AND RUNS SMOOTHLY AT FULL POWER.

A TAPE OF THIS MODULE IS AVAILABLE.

JOB STEPS

1. IF THE UNIT IS A CUSTOMER'S, BE SURE YOU HAVE THE WORK ORDER PROPERLY FILLED OUT WITH THE RIGHT MODEL TYPE AND SERIAL NUMBER. BE SURE THE OWNER HAS SIGNED THE WORK ORDER.

(SEE ILLUSTRATION ON NEXT PAGE) →

JOB STEPS

capital area career center

SERVICE ORDER FORM

SERVICE ORDER № 243

INVOICE DATE 10-2-75

OWNER NAME	John Henery	ENGINE/TRANS. MODEL NO.	16651
STREET ADDRESS	111 Elenton St.	NAME OF EQUIPMENT	B&S
CITY	Lansing	TYPE OR SPEC. NO./HOURS	001901
STATE	Michigan	TYPE OF EQUIPMENT	Engine Mower
ZIP CODE	48854	SERIAL/CODE NO.	111 877
DATE RECEIVED	9-30-75	EQUIP. MODEL & SERIAL NO.	BS001010
DELIVER		PICK UP	↘
CUSTOMER PHONE	676-1000	PROMISED	

ESTIMATE ONLY ☐	COMPRESSION ☐	ENGINE COOLING ☐	TUNE-UP ☐	CHARGING CIRCUIT ☐	LUBE CHASSIS ☐	REPLACE ENGINE ☐	REPAIR AS NEEDED ☒
CARBURETION ☑	SPEED CONTROL ☐	CHANGE ENG. OIL ☑	MANUAL STARTER ☐	SAFETY INTERLOCK ☐	OVERHAUL ☒	PREPARE FOR STORAGE ☐	☐
IGNITION ☑	AIR CLEANER ☐	SHARPEN ☐	ELECTRIC STARTER ☐	BELTS ☐	SHORT BLOCK ☐	WARRANTY ☐	☐

QTY	PART NO. AND DESCRIPTION	AMOUNT	DESCRIPTION OF WORK	AMOUNT
1	Cleaner element		Overhaul engine	
			engine mounted	
TOTAL				

GALS. OF GAS @

QTS. OF OIL @

LBS. OF GREASE @

TOTAL LABOR	
TOTAL PARTS	
ACCESSORIES	
GAS, OIL AND GREASE	
OUTSIDE REPAIRS	
TAX	
TOTAL	

I hereby authorize the above repair work to be done along with the necessary materials. You and your employees may operate above vehicle for purposes of testing, inspection, or delivery at my risk. An express mechanics lien is acknowledged on above vehicle to secure the amount of repairs thereto. It is also understood that you will not be held responsible for loss or damage to cars or articles left in cars in case of fire, theft or any other cause beyond your control.

SIGNATURE John Henery

EE TS1-02

Thank You

4

JOB STEPS

2. AFTER YOU HAVE MADE SURE THAT THE ORDER IS PROPERLY FILLED OUT, REMOVE THE THIRD SHEET, OR THE HARD COPY (CARDBOARD TYPE PAPER).

3. THEN, TAKE THE TWO TOP SHEETS OF THE WORK ORDER TO THE PARTS DEPARTMENT.

NOTE: YOU WILL WORK OFF OF THE HARD COPY. LIST MANY PARTS YOU NEED, IN THE "MATERIAL USED" AREA OF THE WORK ORDER.

IF THE ENGINE IS MOUNTED, BE SURE TO MAKE A NOTE ON THE HARD COPY SO THAT WHEN THE ORDER IS FIGURED, THE CUSTOMER WILL BE CHARGED FOR THAT EXTRA TIME.

WEAR SAFETY GLASSES!

JOB STEPS

5. IF THE ENGINE IS MOUNTED, REMOVE IT FROM ITS MOUNT AS YOU LEARNED IN UNIT 15.

6. IF THE ENGINE IS VERY DIRTY, POWER WASH OR STEAM CLEAN IT. THIS WILL KEEP THE INTERNAL ENGINE PARTS CLEAN.

7. REMOVE AIR FILTER (CHECK THE AIR FILTER OIL BATH. DOES IT HAVE ENOUGH OIL? IS IT CLEAN? IF IT IS FULL OF DIRT, THE ENGINE MAY BE DAMAGED). CHECKING THE FILTER CAN TELL YOU ABOUT THE CONDITION OF THE ENGINE.

8. PUT A NEW AIR FILTER ELEMENT ON THE LIST, IF NEEDED.

NOTE: IF THE AIR FILTER IS OILY, THE RINGS AND VALVES ARE NOT SEALING PROPERLY (USE MODULE 7501 02 002).

WORD GUIDE

DISASSEMBLE - TAKE APART.

JOB STEPS

9. REMOVE THE CARBURETOR AND MAKE A NOTE OF HOW THE GOVERNOR IS HOOKED-UP (USE A MOD FROM UNIT 5 AS A GUIDE).

10. CHECK THE GOVERNOR LINKAGE FOR WEAR (ENLARGED HOLES IN THE CARB THROTTLE PLATE). LOOK AT THE BENDS. IF THE LINK IS WORN, LIST THE PART YOU NEED ON THE HARD COPY.

11. CHECK THE HOLES IN THROTTLE PLATE WHERE THE GOVERNOR LINK GOES.

12. CHECK THE THROTTLE SHAFT FOR LOOSENESS. DISASSEMBLE THE CARBURETOR (REMOVE ANY RUBBER OR NEOPRENE PARTS). IF YOU WANT TO INSTALL A CARBURETOR REBUILD KIT, PUT IT ON THE LIST NOW (USE A MOD FROM UNIT 5 AS A GUIDE).

WORD GUIDE

FRAYED - RIPPED, TORN.

JOB STEPS

- REMOVE THE AIR-HOUSING, IF THIS ENGINE USES A REWIND STARTER IN THE HOUSING.

A. PULL THE ROPE ALL THE WAY OUT.

B. CHECK TO SEE IF THE ROPE IS FRAYED. DOES THE ROPE GO ALL THE WAY BACK IN? FOLLOW THE STEPS IN MODULE 7501 03 004 7.

- IF THE STARTER NEEDS PARTS, PUT THAT ON THE LIST ALSO (USE A MOD FROM UNIT 3).

- NOW, REMOVE THE FLYWHEEL NUT OR STARTER CLUTCH ASSEMBLY.

JOB STEPS

6. REMOVE THE FLYWHEEL. IF YOU DON'T REMEMBER HOW TO DO IT, READ MOD 7501 08 001 7 OVER.

7. USE MERCOTRONIC TESTER TO CHECK COIL, CONDENSER AND POINTS. USE MODS 7501 13 001 7, 7501 13 002 7, AND 7501 13 003 7. WRITE DOWN THE LIST OF PARTS YOU WILL PROBABLY NEED.

8. NOW YOU CAN REMOVE THE HEAD. ASK THESE QUESTIONS:

   A. IS THE HEAD GASKET BLOWN?

   B. HOW MUCH CARBON IS THERE IN THE HEAD AND ON THE PISTONS?

   C. IS THE CARBON HARD OR OILY?

JOB STEPS

18. NOTE: IF THERE IS A LOT OF OIL IN THE CARBON, THAT COULD MEAN THAT THE RINGS ARE VERY BAD OR POSSIBLY THAT THE CYLINDER WILL NEED TO BE REBORED. IF THE CARBON IS HARD, THEN THE RINGS MAY NEED REPLACING, BUT THE CYLINDER MAY NOT NEED REBORING (USE MOD 7501 01 003 7).

19. DRAIN THE OIL.

20. AFTER THE OIL IS DRAINED, HOLD THE CRANKSHAFT AND TRY TO WIGGLE IT. IF IT MOVES TOO MUCH, REPLACE THE SUMP OR INSTALL NEW MAIN BEARINGS (SEE MOD 7501 01 001 7).

JOB STEPS

21. REMOVE THE SUMP OR THE SIDE COVER. (IF THIS ENGINE IS A VERTICAL SHAFT WITH A POWER TAKE-OFF OUT THE SIDE, BE SURE TO REVIEW MOD 7501 01 002 7 BECAUSE THERE IS A HIDDEN BOLT).

22. NOTICE THE WAY THAT THE ROD IS INSTALLED ON THE CRANKSHAFT. IS THERE AN OIL DRIPPER ON THE ROD? HOW IS IT INSTALLED? MAKE A NOTE ON THE HARD COPY SO YOU DON'T FORGET (SEE MOD 7501 01 009 7).

23. BEFORE YOU LOOSEN THE ROD BOLTS OR NUTS, YOU SHOULD ROTATE THE CRANKSHAFT UNTIL THE PISTON IS IN THE MIDDLE OF THE STROKE (THAT WOULD PUT THE PISTON ABOUT ONE INCH OR SO FROM THE TOP OF THE CYLINDER).

JOB STEPS

24. TWIST THE CRANKSHAFT BACK AND FORTH A LITTLE AND NOTICE IF THERE IS ANY PLAY BETWEEN THE ROD AND THE CRANKSHAFT. IF THERE IS, YOU WILL HAVE TO MIKE THE CRANKSHAFT AND WILL NEED A NEW ROD. ADD A NEW ROD TO THE LIST (USE MODULE 7501 01 009 7).

25. LOOSEN THE ROD BOLTS AND REMOVE THE ROD CAP AND DIPPER (IF THERE IS ONE).

26. VERY CAREFULLY, PUSH THE ROD AND PISTON TO THE TOP OF THE CYLINDER. VERY CAREFULLY, PUSH THE PISTON AND ROD OUT OF THE CYLINDER. BE READY TO CATCH THE PISTON AS IT COMES OUT.

JOB STEPS

27. NOW, USING THE MANUAL, REMOVE THE RINGS FROM THE PISTON AND CHECK THE PISTON SKIRT CLEARANCE. REMEMBER TO CHECK IT OPPOSITE THE WRIST PIN BOSSES. IF THE CLEARANCE IS ALL RIGHT, GO TO STEP 28. IF NOT, IT WILL HAVE TO BE REBORED. IF IT HAS TO BE REBORED USE MODULE 7501 16 004 7.

28. CHECK PISTON RING LAND CLEARANCE, IF YOU ARE GOING TO USE THE OLD PISTON. IF IT FAILS THIS TEST, PUT A NEW PISTON ON THE LIST OF PARTS YOU WILL NEED. FOLLOW MODS IN UNIT 23.

29. REMOVE THE CAMSHAFT AND TAPPETS. CHECK FOR CRACKS AND/OR BROKEN TEETH. MIKE THE LOBES ON THE CAMSHAFT. CHECK THE MANUAL TO SEE IF THERE IS A SPEC ON IT. FOLLOW MODS IN UNIT 24.

JOB STEPS

30. REMOVE AND MIKE THE CRANKSHAFT. CHECK THE CHART FOR REJECT SIZES. SEE MODULE 7501 01 021 7 FOR INFORMATION ON HOW TO PROPERLY MIKE A CRANKSHAFT.

31. REMOVE THE VALVE CHAMBER BREATHER ASSEMBLY OR COVER (USE 7501 24 001).

32. REMOVE THE VALVE SPRINGS AND RETAINERS (USE MOD 7501 24 002).

33. REMOVE THE VALVES AND CLEAN THEM ON THE WIRE BRUSH.

34. GRIND THE VALVES AND SEATS AT THE PROPER ANGLE. IF THE SEAT IS TOO WIDE OR TOO HIGH ON THE VALVE FACE, BE SURE TO RELIEVE THE SEAT (USE MOD 7501 24 001 7).

35. IF THE VALVES NEED REPLACING, PUT THEM ON THE PARTS LIST.

JOB STEPS

36. NOW CHECK THE VALVE GUIDES. IF THEY NEED REPLACING, ADD THEM TO YOUR LIST (USE MOD 7501 24 006 OR 7501 24 007 7).

WEAR YOUR SAFETY GLASSES!

37. BEFORE DOING ANYTHING ELSE, BE SURE YOU HAVE ALL PARTS YOU WILL NEED. GO BACK OVER THE LIST AND CHECK. ALSO IS THE MUFFLER ALL RIGHT? IS THE WRISTPIN IN GOOD CONDITION? IF NOT, USE MOD 7501 7501 01 009 7.

38. IF YOU ARE SATISFIED THAT YOU HAVE ALL PARTS LISTED, TAKE THE LIST TO THE PARTS DEPARTMENT AND HAVE THEM LOOK UP THE PRICE OF THE PARTS SO YOU CAN CALL THE CUSTOMER WITH AN ESTIMATE. SEE EXAMPLE ON NEXT PAGE. →

JOB STEPS

SERVICE ORDER FORM

capital area career center

SERVICE ORDER № 243

INVOICE DATE 4 - 12 - 76

OWNER NAME John Doe					
STREET ADDRESS 217 Uptown St.					
CITY Downtown	STATE Mi.		ZIP CODE 4RV12		
DATE RECEIVED 4-5-76	DELIVER	PICK UP	CUSTOMER PHONE 123-4567	PROMISED	

ENGINE/TRANS. MODEL NO. 80520	NAME OF EQUIPMENT Bings
TYPE OR SPEC. NO./HOURS 001901	TYPE OF EQUIPMENT Engine
SERIAL/CODE NO. 277 338617	EQUIP. MODEL & SERIAL NO. 787 943

ESTIMATE ONLY ☐	COMPRESSION ☐	ENGINE COOLING ☐	TUNE-UP ☐	CHARGING CIRCUIT ☐	LUBE CHASSIS ☐	REPLACE ENGINE ☐	REPAIR AS NEEDED ☐
CARBURETION ☐	SPEED CONTROL ☐	CHANGE ENG. OIL ☐	MANUAL STARTER ☐	SAFETY INTERLOCK ☐	OVERHAUL ☐	PREPARE FOR STORAGE ☐	☐
IGNITION ☐	AIR CLEANER ☐	SHARPEN ☐	ELECTRIC STARTER ☐	BELTS ☐	SHORT BLOCK ☐	WARRANTY ☐	☐

QTY	PART NO AND DESCRIPTION	AMOUNT		DESCRIPTION OF WORK	AMOUNT	
1	Filter Element	2	50	Engine not Mounted		
1	Gov Link		10			
1	Throttle Shaft		95			
1	point Set	3	25			
1	Oil Seal top		55			
1	Gasket Set	1	95			
1	Ring Set	4	30			
1	Inc Valve	3	92			
1		18	42			
	Estimate					
	Parts	18	42	GALS. OF GAS @	TOTAL LABOR	50 00
	Overhaul Labor	28	00	QTS. OF OIL @	TOTAL PARTS	47 09
	Tax		67	LBS. OF GREASE @	ACCESSORIES	
					GAS, OIL AND GREASE	
					OUTSIDE REPAIRS	
					TAX	1 89
	TOTAL			SIGNATURE John Doe	TOTAL	98 89

Estimate would be about $100.00

I hereby authorize the above repair work to be done along with the necessary materials. You and your employees may operate above vehicle for purposes of testing, inspection or delivery at my risk. An express mechanics lien is acknowledged on above vehicle to secure the amount of repairs thereto. It is also understood that you will not be held responsible for loss or damage to cars or articles left in cars in case of fire, theft or any other cause beyond your control.

EE T&1-02

Thank You

JOB STEPS

9. WHEN YOU GET BACK THE LIST OF PARTS AND PRICES, TOTAL THEM AND ADD THE TAX.

0. THEN, ESTIMATE AND TOTAL THE LABOR USING A FLAT RATE CHART OR MANUAL.

1. THEN ADD THE TOTAL PARTS, TOTAL LABOR AND TAX.

2. WHEN YOU HAVE THE TOTAL, ROUND IT OFF TO THE NEXT HIGHEST DOLLAR. THEN ADD TEN DOLLARS TO THE TOTAL, CALL THE CUSTOMER AND GIVE HIM/HER THE ESTIMATE PRICE.

NOTE: ADDING TEN DOLLARS BECAUSE:

1. YOU ARE PROTECTING YOURSELF, IN CASE YOU MISSED SOMETHING.

JOB STEPS

2. WHEN THE CUSTOMER COMES TO PICK UP THE MACHINE AND THE BILL IS LOWER THAN THE HIGHEST PRICE QUOTED, THEN THE CUSTOMER IS HAPPY. BUT IF THE BILL IS OVER THE ESTIMATE QUOTED, HE WILL NOT BE HAPPY. SO ALWAYS, ESTIMATE A LITTLE HIGH.

43. WHEN YOU GET PERMISSION TO REPAIR THE ENGINE, WRITE DOWN ON THE ORDER:

1. TO WHOM YOU TALKED.
2. THE TIME.
3. THE DATE.

44. CLEAN ALL OF THE PARTS BEFORE YOU REASSEMBLE THE ENGINE. CLEAN, DRY AND LAY THEM OUT IN ORDER SO YOU DON'T FORGET TO INSTALL A PART.

JOB STEPS

44. REMEMBER: CLEAN CARB PARTS IN CLEANER AFTER YOU HAVE RECEIVED PERMISSION.

WEAR SAFETY GLASSES!

45. REBORE OR DEGLAZE THE CYLINDER (USE MOD 7501 23 003 7).

46. INSTALL THE RINGS IN THE CYLINDER AND CHECK THE END GAP OF THE RINGS. BE SURE THE WRIST PIN LOCKS ARE IN AND TIGHT (USE MOD 7501 23 003 7).

47. CORRECTLY INSTALL THE NEW RINGS ON THE PISTON AND HAVE THE INSTRUCTOR CHECK THE RINGS BEFORE YOU INSTALL THE ROD AND PISTON IN THE CYLINDER (USE MOD 7501 23 001 7).

JOB STEPS

48. INSTALL THE PISTON RING COMPRESSOR AND BE SURE TO COAT THE RINGS AND PISTON WITH OIL (USE MOD 7501 23 002 7).

49. VERY CAREFULLY INSTALL THE PISTON AND ROD ASSEMBLY IN THE CYLINDER. BE SURE THAT THE ROD IS GOING BACK IN THE PROPER POSITION (USE MOD 7501 01 009 7).

50. BE SURE TO LUBRICATE THE ROD OR CRANK PIN OF THE CRANKSHAFT.

51. INSTALL THE ROD CAP, AND TORQUE TO PROPER SPECIFICATION (USE MOD 7501 01 009 7).

52. BEND THE ROD LOCKS, IF USED. HAVE THE INSTRUCTOR CHECK THE ROD LOCKS.

53. IF THE ENGINE IS A VERTICAL SHAFT, INSTALL THE OIL SLINGER, IF USED (USE MOD 7501 01 025).

WORD GUIDE

ALIGN - PUT IN POSITION

JOB STEPS

54. INSTALL THE TAPPETS AND CAMSHAFT (BE SURE TO LUBRICATE THE CAMSHAFT BEARINGS) AND BE SURE TO ALIGN THE TIMING MARKS. NOW, HAVE THE INSTRUCTOR GIVE A FINAL INSPECTION (USE MOD 7501 01 004 7).

55. INSTALL THE NEW GASKET ON THE BLOCK (IF THE GASKET IS SHRIVELLED, YOU WILL HAVE TO SOAK IT IN WATER).

56. NOW YOU SHOULD BE SURE TO LUBRICATE THE OTHER MAIN BEARING AND INSTALL THE SUMP (USE MOD 7501 01 001 7).

57. IF YOU HAVE A MECHANICAL GOVERNOR GEAR ON YOUR SUMP, AND (AS YOU PUSH IT DOWN THE SHAFT) IF THE SUMP DOESN'T GO ALL

WORD GUIDE

MESHED - IN LINE WITH, LINKED TO; ATTACHED.

JOB STEPS

THE WAY DOWN TO THE BLOCK, DON'T FORCE THE SUMP BECAUSE THE PLASTIC GOVERNOR GEAR MAY NOT BE MESHED WITH THE CAM GEAR). WITH ONE HAND, ROTATE THE CRANKSHAFT UNTIL THE GEAR ALIGNS WITH THE OTHER GEAR, AND THE SUMP SLIDES ALL THE WAY TO THE BLOCK.

58. NOW INSTALL TWO BOLTS AND TIGHTEN THEM (OR TORQUE, IF THERE IS A SPECIFICATION GIVEN IN THE REPAIR MANUAL).

59. CHECK THE END PLAY IN THE CRANKSHAFT AND ADJUST, IF NEEDED. HAVE THE INSTRUCTOR CHECK IT. IF IT IS ALL RIGHT, INSTALL BOTH OIL SEALS (USE MOD 7501 01 017 7).

JOB STEPS

60. YOU ARE NOW READY TO INSTALL THE VALVES. FIRST, YOU MUST CHECK THE VALVE CLEARANCE. BE SURE TO CHECK THE CHART.

61. GRIND THE PROPER CLEARANCE ON THE VALVE STEM. HAVE THE INSTRUCTOR CHECK YOUR WORK UP TO THIS POINT (USE MOD 7501 24 010 7).

62. NOW, HOOK UP THE VALVE SPRINGS AND RETAINERS (USE MOD 7501 24 002 7).

63. INSTALL THE VALVE BREATHER ASSEMBLY AND BE SURE THAT THE DRAIN HOLE FOR THE OIL IS POINTED DOWN.

64. RESURFACE THE HEAD. IF YOU DON'T REMEMBER HOW, THEN GET MOD 7501 01 003 7.

JOB STEPS

65. INSTALL THE HEAD AND TORQUE IT TO THE PROPER SPECIFICATIONS. ALSO, BE SURE TO INSTALL ANY SHROUDING OR SHUT-OFFS THAT GO UNDER THE HEAD BOLTS. ON TECUMSEH, DO THIS STEP AFTER TIMING THE MAG (USE MOD 7501 01 003).

66. START WORKING ON THE MAGNETO. INSTALL THE POINT PLUNGER AND INSTALL THE POINTS, COIL, AND CONDENSER (USE A MOD FROM UNIT 8).

67. SET THE POINTS ACCORDING TO MANUFACTURER'S SPECIFICATIONS (USUALLY .020).

68. WIPE A CLEAN PIECE OF LINTLESS PAPER THROUGH THE POINTS TO CLEAN THEM AND INSTALL THE FLYWHEEL.

JOB STEPS

69. KEY LOOSELY AND SPIN THE FLYWHEEL TO CHECK FOR SPARKS.

70. IF YOU HAD SPARKS, THEN INSTALL THE COVER ON THE POINTS AND RECHECK FOR SPARKS.

71. THEN, INSTALL THE FLYWHEEL NUT OR CLUTCH (IF CLUTCH IS USED TO HOLD THE FLYWHEEL ON, BE SURE TO OIL OR GREASE THE SHAFT). USE MOD 7501 08 001 7.

72. ADJUST THE ARMATURE OR COIL CLEARANCE TO THE FLYWHEEL. YOU WILL FIND THIS INFORMATION ON THE CHART (USUALLY .010).

73. REMOVE THE CARBURETOR FROM THE CARB CLEANER AND BLOW IT OUT WITH THE AIR HOSE. OPEN UP THE CARB REPAIR KIT AND CHECK TO BE SURE ALL OF THE PARTS

JOB STEPS

ARE THERE. IF THERE ARE INSTRUCTIONS IN THE CARB KIT, READ THEM BEFORE TRYING TO PUT IT BACK TOGETHER (USE A MOD FROM UNIT 5).

74. REASSEMBLE THE CARB (CHECK FLOAT LEVEL, NEEDLE ADJUSTMENT, ETC).

75. INSTALL THE CARB BACK ONTO THE MAINFOLD OR BLOCK.

76. HOOK-UP THE GOVERNOR LINK TO THE PROPER HOLE IN THE THROTTLE PLATE OF THE CARB.

77. INSTALL THE CARB ON THE ENGINE. BE SURE TO ADJUST THE GOVERNOR LINKAGE AND THAT ALL OF THE LINKAGE IS FREE OF BINDING.

TURN PAGE →

JOB STEPS

78. INSTALL THE AIR HOUSING OR STARTER ASSEMBLY (USE MOD 7501 05 006 7).

79. BE SURE THE AIR FILTER HAS BEEN CLEANED PROPERLY. ALSO, IF NEEDED, RE-OIL THE FILTER (USE MOD 7501 02 001 7).

80. NOW MOUNT THE ENGINE AND FILL WITH OIL TO THE PROPER OIL LEVEL (USE A MOD FROM UNIT 15).

81. START, ADJUST AND CHECK FOR OIL LEAKS (USE MOD 7501 05 007 7).

82. IF THE ENGINE IS USED ON A ROTARY MOWER, BE SURE TO USE THE TACHOMETER TO CHECK TOP WARNING. DO NOT EXCEED THE BLADE TIP SPEED LAW.

83. HAVE THE INSTRUCTOR CHECK YOUR WORK.